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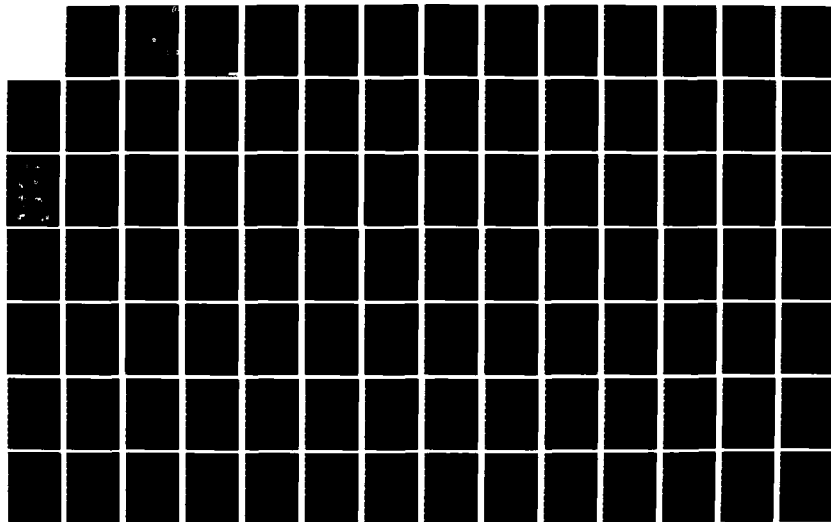
APPLICATION OF STREAMTUBE COMPUTER MODEL TO LOCK AND
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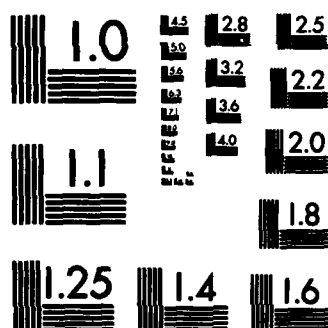
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APPLICATION OF STREAMTUBE COMPUTER
MODEL TO LOCK AND DAM NO. 26
(REPLACEMENT) PROJECT

Prepared for

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT
CORPS OF ENGINEERS



Prepared by

DTIC
ELECTE
DEC 7 1983
S D D

Civil Engineering Department
Engineering Research Center
Colorado State University
Fort Collins, Colorado

A. MOLINAS

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APPLICATION OF STREAMTUBE COMPUTER

MODEL TO LOCK AND DAM NO. 26

(REPLACEMENT) PROJECT

Prepared for

Department of the Army

St. Louis District

Corps of Engineers

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Prepared by

Civil Engineering Department
Engineering Research Center
Colorado State University
Fort Collins, Colorado

Albert Molinas

October, 1983

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FOREWORD

The work described in this report was performed under Contract No. DACW43-83-C-0054 entitled, "Application of Streamtube Computer Model to Lock and Dam No. 26 (Replacement) Project," between the Department of the Army, St. Louis District, Corps of Engineers and the Colorado State University, Fort Collins, Colorado.

The report is a study of the prevailing hydraulic and sediment transport conditions at the Lock and Dam No. 26 (Replacement) site for the Stage I cofferdam, and the estimation of future river channel response to the Stage II cofferdam utilizing the Streamtube Computer Model. The Streamtube Computer Model was originally developed by Dr. Albert Molinas at Colorado State University for the U.S. Bureau of Reclamation (January 1983) and subsequently was revised and expanded to accomodate this study. The report was prepared by Dr. A. Molinas, Assistant Professor of Civil Engineering, Colorado State University, Fort Collins, Colorado.

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I. Introduction

The Streamtube Computer Model was developed to simulate long-term streambed variations in rivers for which sediment and hydraulic data is limited. The use of stream tubes was to allow the lateral and longitudinal variation of hydraulic conditions as well as sediment activity at the cross sections along the study reach. The object of the model is to study complicated sedimentation problems for which there is interaction between the flowing water-sediment mixture and the alluvial river channel boundaries. In order to accomplish this purpose, the water surface profile and other hydraulic variable computations for supercritical, subcritical and the combination of both flow conditions can be carried out without interruption. The bed armouring and the breaking of armour layer is incorporated to study longer periods of flow durations.

The computer program is a semi-two-dimensional program with the third dimension, depth, being intrinsically incorporated into the computations. As such, it has the basic limitations of every two-dimensional program; secondary flows cannot be simulated. The channel is divided into preselected number of tubes. The bed elevation in each stream tube is allowed to move vertically up or down depending on the flow conditions. As a result, while one section of channel is eroding another section might be aggrading. Depending on the number of stream tubes to be used, the channel cross section changes are averaged across different channel sections of different widths. Since the computer time and space is directly related to the number of stream tubes to be used, the user is required to decide on the optimum number of tubes. Bed forms are not simulated due to the lack of a generally accepted

methodology for determining them. Even though provisions are made to expand the program to include river confluences, and middle islands, at this point these options are not available. The channel boundaries are fixed in the lateral direction and formation of meander bends cannot be simulated.

The computer model using stream tubes can be applied into variety of river problems. It can be used as a fixed-bed model to compute water surface profiles for subcritical, supercritical or the combination of both flow conditions involving hydraulic jumps. This option allows the applications involving the computation of water surface profiles in man-made channels with clear water, flow profiles over spillways, or flow profiles in natural river channels where the interaction between the sediment-water mixture and the channel bed is negligible, in other words where the bed elevation changes are negligible. As a movable-bed model, the computer program can be applied to route water and sediment through natural river channels. The use of stream tubes allow the variation of hydraulic conditions and sediment activity not only in the longitudinal, but also in the lateral direction. With the selection of a single stream tube, the model becomes one-dimensional. Average channel response to changes in certain river flow or sediment conditions can be studied. With the selection of multiple stream tubes the model becomes two-dimensional. The changes in the cross-section geometries in the lateral direction can be simulated. Since the bed-elevation changes are not averaged over the entire active channel widths as in one-dimensional models, more realistic channel erosion or aggradation can be simulated. This option provides valuable information where a certain navigation depths have to be maintained. It can also be used in bank

stability problems to identify expected regions of bank instabilities. The armouring process provided in the program allows to study river sedimentation and scouring problems for longer periods of times.

The application of the Streamtube Computer Model to study the hydraulic and sediment conditions at the Lock and Dam No. 26 (Replacement) site, shown in Figure 1.1, was accomplished in three phases. The first phase was identified as familiarization with the project and development of the basic data for the water and sediment routing. Second phase was the calibration and verification of the computer model utilizing Stage 1 cofferdam hydraulic conditions and river bed measurements. Third phase was the application of the computer model to Stage 2 cofferdam design.

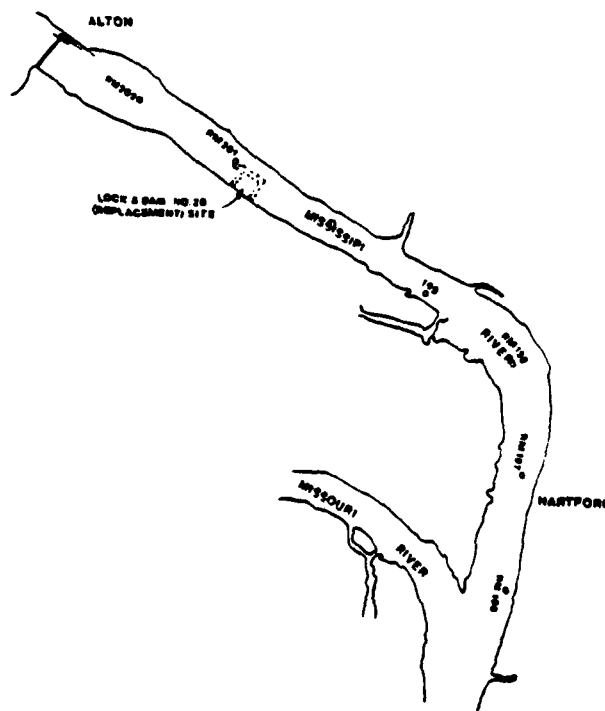


Figure 1.1. General layout of the Lock and Dam No. 26 (Replacement) site.

Development of the data set for Stage 1 cofferdam is presented in Chapter 2 of this report. This data set was used in computing the hydraulic and sediment transport conditions at the Stage I cofferdam site in Phase II of the study. The results of the computations are presented in Chapter 3. The data set used to predict hydraulic conditions and the scouring for the Stage II cofferdam is presented in Chapter 4. This data was used in the final phase of the study, the application of the computer model to Stage II cofferdam design, and the results of the computations are presented later, in the same chapter.

II. Development of the Basic Data Set for the Determination of Hydraulic and Sediment Conditions at Lock and Dam No. 26 Replacement Site for Stage I Cofferdam Study

This chapter presents the development of the basic data set for the calibration and verification runs of the computer model. The source of the reduced hydraulic, hydrologic and sediment data were documents provided by the U.S. Corps of Engineers, St. Louis District. These documents, describing various aspects of the Lock and Dam No. 26 (Replacement) Project were:

- a. Design Memorandums for Lock and Dam No. 26 (Replacement)
 1. DM No. 1, Hydrology
 2. DM No. 9, Dam
 3. DM No. 12, Lock
 4. DM No. 2, General Design
 5. DM No. 7, Cofferdam
- b. Prototype velocity and scour survey data.
- c. Hydrographic survey maps of the river reach being studied.
- d. Daily stage and discharge data pertaining to the upstream and downstream boundary stations, Alton, Illinois and Hartford, Illinois.
- e. Preliminary unpublished model data for first and second stage cofferdams.
- f. Sediment gradation curves.

The basic data set consists of three groups, namely of stage-discharge, cross section and sediment data. For each of these groups the source, the reduction and the final data for the proposed analysis is discussed and presented.

2.1 Stage-Discharge Data

The daily discharges of the Mississippi River at Alton, Illinois, and for the water year October 1981 to September 1982 have been provided

by Mr. Charles Denzel of the Corps of Engineers, St. Louis District. The document is a copy of the discharge file by the United States Department of Interior-Geological Survey (Mississippi River at Alton, Illinois; Station Number 05587500). The daily discharges of interest cover January 1982 through August 1982. They are given in Table 2.1 and are graphically displayed in Figure 2.1.

The stages at Lock and Dam No. 26 and Hartford, Illinois are obtained from handwritten records provided by the Corps of Engineers, St. Louis District. These records also contain the stages at the upstream and downstream side of the Lock and Dam No. 26 replacement (Phase 1). Table 2.2 gives the stage and the corresponding discharge at Hartford, Illinois. Figure 2.2a, b and c, and Figure 2.3a and b are various displays of the stage-discharge data. In Figure 2.2a the stage-discharge is represented on a linear-linear scale plot as a continuous line in time. There seems to be a general looping effect for rising and falling stage, however, there appears to be no regularity among the various loops. The daily stage-discharge data points corresponding to Figure 2.2a are plotted on a linear-linear scale in Figure 2.2b and the logarithm of the stage-discharge are plotted in Figure 2.2c.

The stage-discharge regression equation for the given data is:

$$\text{Stage} = .033 \cdot Q^{.527} + 390 \quad (1)$$

The regression coefficient for equation 1 is $r^2 = .92$. Figure 2.3a shows the predicted stage-discharge values as given by equation 1 and the actual data points on a linear-linear scale. The same data is plotted on a log-log scale in Figure 2.3b.

All plots show a significant scatter of the real data around the predicted values (equation 1). The use of this regression equation to

Table 2.1. Daily discharges for Mississippi River at Alton for January 1982 - August 1982.

DISCHARGES AT ALTON FOR JAN 1962-AUG 1962			
INDEX	DAILY INDEX	DAILY DISCHARGE	DISCHARGE
DAY NO.	DAY NO.	DAY NO.	DAY NO.
1	(51)	51,000	1-73000E+05
2	(52)	52,000	2-53000E+05
3	(53)	53,000	3-73000E+05
4	(54)	54,000	4-78000E+05
5	(55)	55,000	5-80000E+05
6	(56)	56,000	6-72000E+05
7	(57)	57,000	7-41000E+05
8	(58)	58,000	8-30000E+05
9	(59)	59,000	9-27000E+05
10	(60)	60,000	10-80000E+05
11	(61)	61,000	11-80000E+05
12	(62)	62,000	12-89000E+05
13	(63)	63,000	13-63000E+05
14	(64)	64,000	14-17000E+05
15	(65)	65,000	15-67000E+05
16	(66)	66,000	16-50000E+05
17	(67)	67,000	17-38000E+05
18	(68)	68,000	18-13000E+05
19	(69)	69,000	19-29000E+05
20	(70)	70,000	20-12000E+05
21	(71)	71,000	21-14000E+05
22	(72)	72,000	22-19000E+05
23	(73)	73,000	23-65000E+05
24	(74)	74,000	24-33000E+05
25	(75)	75,000	25-55000E+05
26	(76)	76,000	26-80000E+05
27	(77)	77,000	27-37000E+05
28	(78)	78,000	28-29000E+05
29	(79)	79,000	29-40000E+05
30	(80)	80,000	30-47000E+05
31	(81)	81,000	31-51000E+05
32	(82)	82,000	32-43000E+05
33	(83)	83,000	33-57000E+05
34	(84)	84,000	34-69000E+05
35	(85)	85,000	35-55000E+05
36	(86)	86,000	36-22000E+05
37	(87)	87,000	37-68000E+05
38	(88)	88,000	38-60000E+05
39	(89)	89,000	39-67000E+05
40	(90)	90,000	40-87000E+05
41	(91)	91,000	41-82000E+05
42	(92)	92,000	42-78000E+05
43	(93)	93,000	43-73000E+05
44	(94)	94,000	44-64000E+05
45	(95)	95,000	45-65000E+05
46	(96)	96,000	46-55000E+05
47	(97)	97,000	47-73000E+05
48	(98)	98,000	48-10000E+05
49	(99)	99,000	49-14000E+05
50	(100)	100,000	50-48000E+05
101	(101)	101,000	2-53000E+05
102	(102)	102,000	3-50000E+05
103	(103)	103,000	4-73000E+05
104	(104)	104,000	5-60000E+05
105	(105)	105,000	6-40000E+05
106	(106)	106,000	7-41000E+05
107	(107)	107,000	8-30000E+05
108	(108)	108,000	9-20000E+05
109	(109)	109,000	10-10000E+05
110	(110)	110,000	11-80000E+05
111	(111)	111,000	12-89000E+05
112	(112)	112,000	13-63000E+05
113	(113)	113,000	14-17000E+05
114	(114)	114,000	15-67000E+05
115	(115)	115,000	16-50000E+05
116	(116)	116,000	17-38000E+05
117	(117)	117,000	18-13000E+05
118	(118)	118,000	19-29000E+05
119	(119)	119,000	20-12000E+05
120	(120)	120,000	21-14000E+05
121	(121)	121,000	22-19000E+05
122	(122)	122,000	23-65000E+05
123	(123)	123,000	24-33000E+05
124	(124)	124,000	25-55000E+05
125	(125)	125,000	26-80000E+05
126	(126)	126,000	27-37000E+05
127	(127)	127,000	28-29000E+05
128	(128)	128,000	29-40000E+05
129	(129)	129,000	30-47000E+05
130	(130)	130,000	31-51000E+05
131	(131)	131,000	32-43000E+05
132	(132)	132,000	33-57000E+05
133	(133)	133,000	34-69000E+05
134	(134)	134,000	35-55000E+05
135	(135)	135,000	36-22000E+05
136	(136)	136,000	37-68000E+05
137	(137)	137,000	38-60000E+05
138	(138)	138,000	39-67000E+05
139	(139)	139,000	40-87000E+05
140	(140)	140,000	41-82000E+05
141	(141)	141,000	42-78000E+05
142	(142)	142,000	43-73000E+05
143	(143)	143,000	44-64000E+05
144	(144)	144,000	45-65000E+05
145	(145)	145,000	46-55000E+05
146	(146)	146,000	47-73000E+05
147	(147)	147,000	48-10000E+05
148	(148)	148,000	49-14000E+05
149	(149)	149,000	50-48000E+05
150	(150)	150,000	2-43000E+05

Table 2.1. Continued.

INDEX			DAILY DISCHARGES AT ALTON FOR JAN 1982-AUG 1982			INDEX			DISCHARGE		
DAY NO.			DAY NO.			DAY NO.			DAY NO.		
DISCHARGE			DISCHARGE			DISCHARGE			DISCHARGE		
(151)	151.00	2.43000E+05	(180)	180.00	2.30000E+05	(209)	209.00	1.99000E+05	(237)	237.00	74300.
(152)	152.00	2.36000E+05	(181)	181.00	2.30000E+05	(210)	210.00	1.10000E+05	(238)	238.00	1.10000E+05
(153)	153.00	2.31000E+05	(182)	182.00	2.27000E+05	(211)	211.00	1.01000E+05	(239)	239.00	57700.
(154)	154.00	2.22000E+05	(183)	183.00	2.10000E+05	(212)	212.00	1.85000E+05	(240)	240.00	53500.
(155)	155.00	2.32000E+05	(184)	184.00	1.82000E+05	(213)	213.00	1.31000E+05	(241)	241.00	72000.
(156)	156.00	2.41000E+05	(185)	185.00	1.89000E+05	(214)	214.00	1.49000E+05	(242)	242.00	97800.
(157)	157.00	2.45000E+05	(186)	186.00	1.73000E+05	(215)	215.00	1.41000E+05	(243)	243.00	1.16000E+05
(158)	158.00	2.36000E+05	(187)	187.00	1.47000E+05	(216)	216.00	1.43000E+05	(244)	244.00	1.10000E+05
(159)	159.00	2.23000E+05	(188)	188.00	1.38000E+05	(217)	217.00	1.21000E+05	(245)	245.00	68000.
(160)	160.00	2.06000E+05	(189)	189.00	1.46000E+05	(218)	218.00	90000.	(246)	246.00	74300.
(161)	161.00	1.88000E+05	(190)	190.00	1.57000E+05	(219)	219.00	90000.			
(162)	162.00	1.61000E+05	(191)	191.00	1.73000E+05	(220)	220.00	80200.			
(163)	163.00	1.62000E+05	(192)	192.00	1.05000E+05	(221)	221.00	75100.			
(164)	164.00	1.72000E+05	(193)	193.00	1.81000E+05	(222)	222.00	80400.			
(165)	165.00	1.82000E+05	(194)	194.00	2.07000E+05	(223)	223.00	1.04000E+05			
(166)	166.00	1.79000E+05	(195)	195.00	2.35000E+05	(224)	224.00	89700.			
(167)	167.00	1.61000E+05	(196)	196.00	2.48000E+05	(225)	225.00	80100.			
(168)	168.00	1.20000E+05	(197)	197.00	2.61000E+05	(226)	226.00	70300.			
(169)	169.00	88700.	(198)	198.00	2.71000E+05	(227)	227.00	56900.			
(170)	170.00	1.09000E+05	(199)	199.00	2.73000E+05	(228)	228.00	67300.			
(171)	171.00	1.02000E+05	(200)	200.00	2.50000E+05	(229)	229.00	67700.			
(172)	172.00	1.04000E+05	(201)	201.00	2.02000E+05	(230)	230.00	53500.			
(173)	173.00	1.14000E+05	(202)	202.00	1.70000E+05	(231)	231.00	62500.			
(174)	174.00	1.32000E+05	(203)	203.00	1.64000E+05	(232)	232.00	72000.			
(175)	175.00	1.28000E+05	(204)	204.00	1.51000E+05	(233)	233.00	97800.			
(176)	176.00	1.19000E+05	(205)	205.00	1.41000E+05	(234)	234.00	1.16000E+05			
(177)	177.00	1.09000E+05	(206)	206.00	1.35000E+05	(235)	235.00	1.10000E+05			
(178)	178.00	1.36000E+05	(207)	207.00	1.25000E+05	(236)	236.00	68000.			
(179)	179.00	2.18000E+05	(208)	208.00	1.23000E+05	(237)	237.00	74300.			

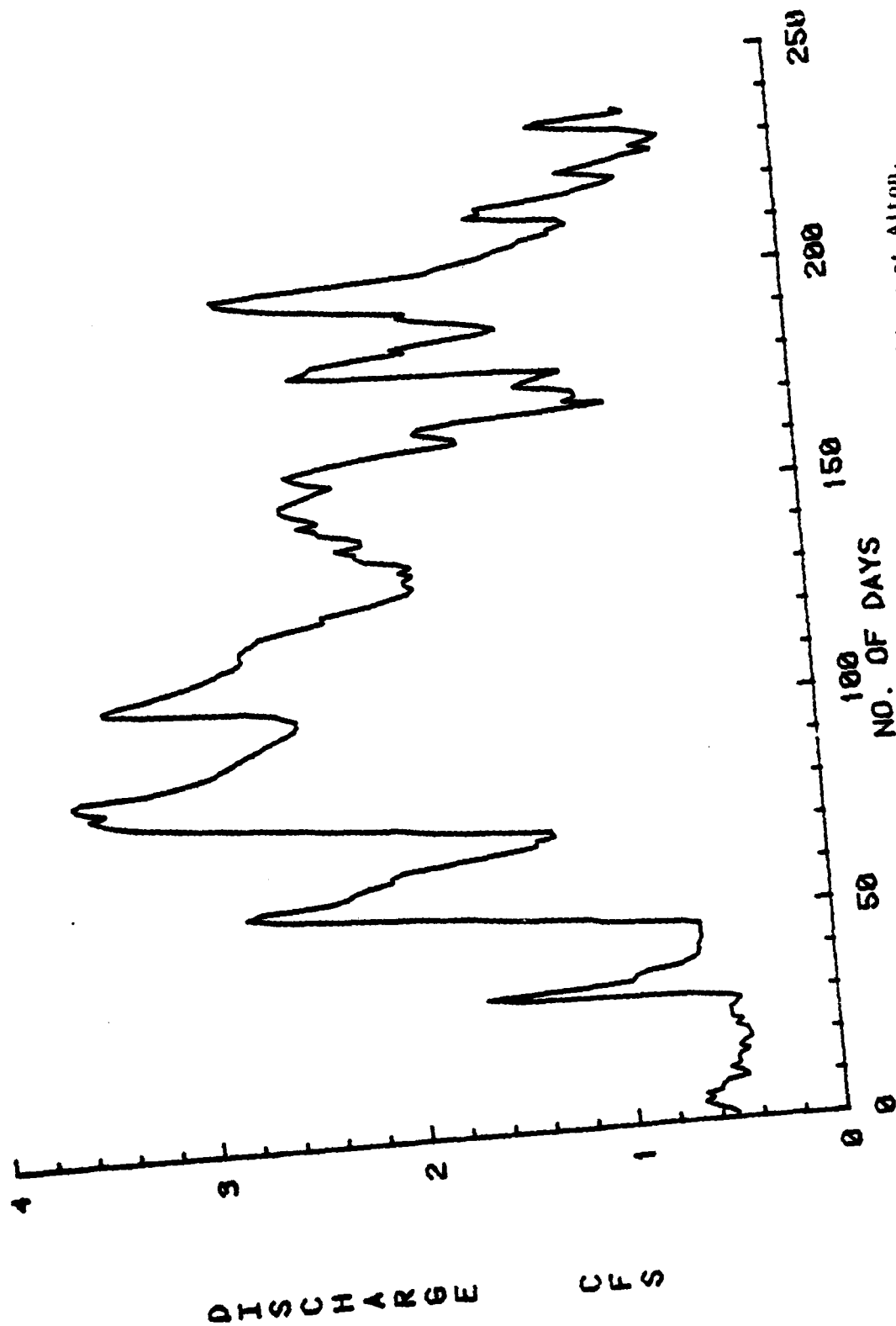


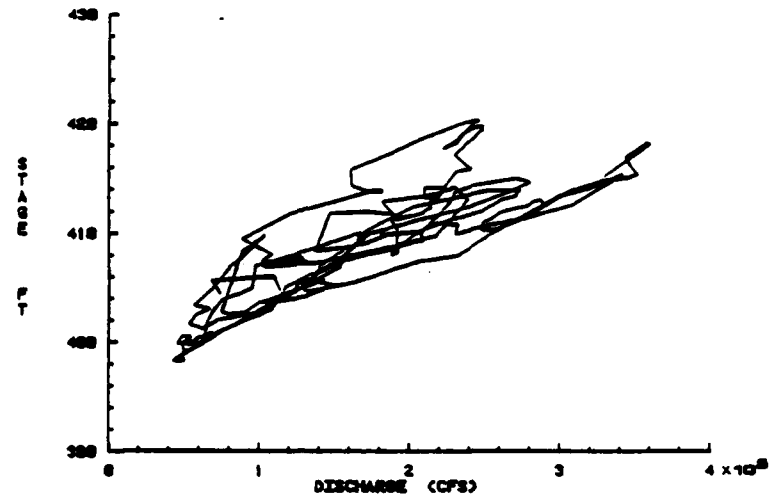
Figure 2.1. Daily discharges for Mississippi River at Alton.

Table 2.2. Stage and discharge at Hartford, Illinois.

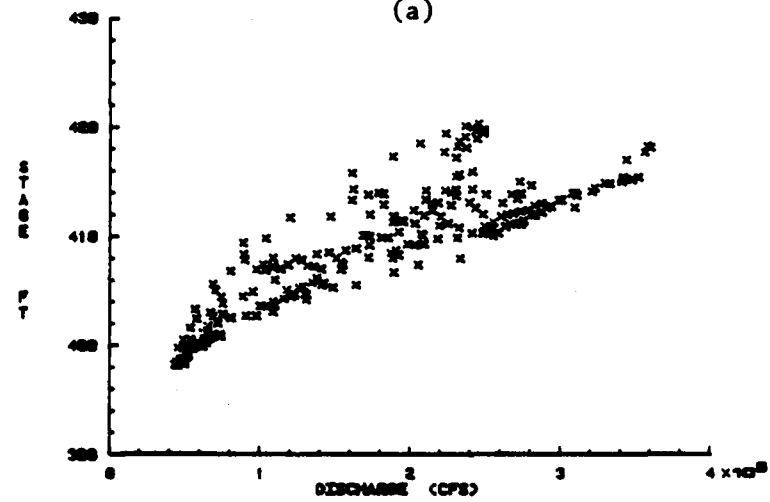
INDEX DISCHARGE			STAGE DISCHARGE HYDROGRAPH AT HARTFORD			INDEX DISCHARGE			INDEX DISCHARGE			INDEX DISCHARGE		
ELEVATION			ELEVATION			ELEVATION			ELEVATION			ELEVATION		
INDEX	DISCHARGE	ELEVATION	INDEX	DISCHARGE	ELEVATION	INDEX	DISCHARGE	ELEVATION	INDEX	DISCHARGE	ELEVATION	INDEX	DISCHARGE	ELEVATION
(1)	52300.	399.77	(51)	1.73000E+05	409.95	(101)	2.53000E+05	410.20	(101)	2.53000E+05	410.20	(101)	2.53000E+05	410.20
(2)	55200.	399.71	(52)	2.03000E+05	411.14	(102)	2.58000E+05	410.30	(102)	2.58000E+05	410.30	(102)	2.58000E+05	410.30
(3)	62100.	399.91	(53)	2.43000E+05	412.57	(103)	2.73000E+05	411.20	(103)	2.73000E+05	411.20	(103)	2.73000E+05	411.20
(4)	67500.	400.84	(54)	2.67000E+05	413.81	(104)	3.09000E+05	412.60	(104)	3.09000E+05	412.60	(104)	3.09000E+05	412.60
(5)	63700.	400.30	(55)	2.80000E+05	414.54	(105)	3.40000E+05	415.30	(105)	3.40000E+05	415.30	(105)	3.40000E+05	415.30
(6)	65300.	400.52	(56)	2.72000E+05	414.94	(106)	3.41000E+05	415.40	(106)	3.41000E+05	415.40	(106)	3.41000E+05	415.40
(7)	58700.	400.31	(57)	2.41000E+05	414.30	(107)	3.32000E+05	414.80	(107)	3.32000E+05	414.80	(107)	3.32000E+05	414.80
(8)	58100.	400.03	(58)	2.30000E+05	413.70	(108)	3.20000E+05	414.10	(108)	3.20000E+05	414.10	(108)	3.20000E+05	414.10
(9)	55800.	400.07	(59)	2.27000E+05	412.84	(109)	3.10000E+05	413.30	(109)	3.10000E+05	413.30	(109)	3.10000E+05	413.30
(10)	45500.	399.70	(60)	2.20000E+05	411.80	(110)	3.00000E+05	413.70	(110)	3.00000E+05	413.70	(110)	3.00000E+05	413.70
(11)	48900.	400.52	(61)	2.08000E+05	410.10	(111)	2.83000E+05	412.70	(111)	2.83000E+05	412.70	(111)	2.83000E+05	412.70
(12)	54100.	400.50	(62)	2.09000E+05	409.30	(112)	2.87000E+05	412.20	(112)	2.87000E+05	412.20	(112)	2.87000E+05	412.20
(13)	49100.	399.52	(63)	2.03000E+05	409.22	(113)	2.82000E+05	411.90	(113)	2.82000E+05	411.90	(113)	2.82000E+05	411.90
(14)	50200.	399.37	(64)	1.87000E+05	408.48	(114)	2.75000E+05	411.40	(114)	2.75000E+05	411.40	(114)	2.75000E+05	411.40
(15)	49000.	398.78	(65)	1.72000E+05	408.06	(115)	2.72000E+05	411.20	(115)	2.72000E+05	411.20	(115)	2.72000E+05	411.20
(16)	44700.	398.40	(66)	1.55000E+05	407.42	(116)	2.73000E+05	411.10	(116)	2.73000E+05	411.10	(116)	2.73000E+05	411.10
(17)	42300.	398.17	(67)	1.38000E+05	406.20	(117)	2.70000E+05	411.20	(117)	2.70000E+05	411.20	(117)	2.70000E+05	411.20
(18)	46800.	398.52	(68)	1.38000E+05	405.30	(118)	2.70000E+05	411.10	(118)	2.70000E+05	411.10	(118)	2.70000E+05	411.10
(19)	43800.	398.21	(69)	1.29000E+05	405.40	(119)	2.66000E+05	411.10	(119)	2.66000E+05	411.10	(119)	2.66000E+05	411.10
(20)	43800.	398.18	(70)	1.31000E+05	404.63	(120)	2.63000E+05	410.90	(120)	2.63000E+05	410.90	(120)	2.63000E+05	410.90
(21)	41900.	398.14	(71)	1.64000E+05	405.55	(121)	2.64000E+05	410.70	(121)	2.64000E+05	410.70	(121)	2.64000E+05	410.70
(22)	49500.	398.23	(72)	1.89000E+05	406.50	(122)	2.41000E+05	410.30	(122)	2.41000E+05	410.30	(122)	2.41000E+05	410.30
(23)	47200.	398.56	(73)	2.05000E+05	407.41	(123)	2.31000E+05	409.90	(123)	2.31000E+05	409.90	(123)	2.31000E+05	409.90
(24)	51800.	399.21	(74)	2.30000E+05	407.99	(124)	2.32000E+05	410.80	(124)	2.32000E+05	410.80	(124)	2.32000E+05	410.80
(25)	51800.	399.06	(75)	2.55000E+05	409.99	(125)	2.19000E+05	411.00	(125)	2.19000E+05	411.00	(125)	2.19000E+05	411.00
(26)	52200.	399.06	(76)	2.80000E+05	411.93	(126)	2.07000E+05	410.20	(126)	2.07000E+05	410.20	(126)	2.07000E+05	410.20
(27)	49500.	398.76	(77)	3.07000E+05	413.93	(127)	1.98000E+05	409.30	(127)	1.98000E+05	409.30	(127)	1.98000E+05	409.30
(28)	47500.	398.76	(78)	3.20000E+05	414.86	(128)	1.90000E+05	408.70	(128)	1.90000E+05	408.70	(128)	1.90000E+05	408.70
(29)	51100.	398.95	(79)	3.40000E+05	415.00	(129)	1.88000E+05	408.60	(129)	1.88000E+05	408.60	(129)	1.88000E+05	408.60
(30)	73700.	400.86	(80)	3.47000E+05	415.19	(130)	1.92000E+05	408.30	(130)	1.92000E+05	408.30	(130)	1.92000E+05	408.30
(31)	1.54000E+05	406.94	(81)	3.51000E+05	415.42	(131)	1.92000E+05	410.40	(131)	1.92000E+05	410.40	(131)	1.92000E+05	410.40
(32)	1.68000E+05	410.09	(82)	3.43000E+05	416.99	(132)	1.88000E+05	411.30	(132)	1.88000E+05	411.30	(132)	1.88000E+05	411.30
(33)	1.24000E+05	407.97	(83)	3.57000E+05	418.28	(133)	1.94000E+05	411.40	(133)	1.94000E+05	411.40	(133)	1.94000E+05	411.40
(34)	97500.	406.57	(84)	3.58000E+05	418.10	(134)	1.88000E+05	411.80	(134)	1.88000E+05	411.80	(134)	1.88000E+05	411.80
(35)	95400.	404.95	(85)	3.55000E+05	417.69	(135)	1.95000E+05	411.40	(135)	1.95000E+05	411.40	(135)	1.95000E+05	411.40
(36)	88800.	404.48	(86)	3.22000E+05	414.41	(136)	2.09000E+05	411.90	(136)	2.09000E+05	411.90	(136)	2.09000E+05	411.90
(37)	75100.	403.82	(87)	3.09000E+05	413.94	(137)	2.14000E+05	412.40	(137)	2.14000E+05	412.40	(137)	2.14000E+05	412.40
(38)	58800.	402.61	(88)	3.08000E+05	412.30	(138)	2.14000E+05	413.00	(138)	2.14000E+05	413.00	(138)	2.14000E+05	413.00
(39)	55400.	401.74	(89)	2.90000E+05	412.60	(139)	2.23000E+05	413.20	(139)	2.23000E+05	413.20	(139)	2.23000E+05	413.20
(40)	64500.	401.38	(90)	2.87000E+05	413.00	(140)	2.10000E+05	414.20	(140)	2.10000E+05	414.20	(140)	2.10000E+05	414.20
(41)	65100.	401.17	(91)	2.82000E+05	412.90	(141)	2.10000E+05	413.30	(141)	2.10000E+05	413.30	(141)	2.10000E+05	413.30
(42)	64800.	400.72	(92)	2.76000E+05	412.40	(142)	2.18000E+05	413.10	(142)	2.18000E+05	413.10	(142)	2.18000E+05	413.10
(43)	63200.	400.55	(93)	2.73000E+05	412.30	(143)	2.30000E+05	415.50	(143)	2.30000E+05	415.50	(143)	2.30000E+05	415.50
(44)	64000.	400.28	(94)	2.64000E+05	412.10	(144)	2.32000E+05	415.70	(144)	2.32000E+05	415.70	(144)	2.32000E+05	415.70
(45)	63600.	400.45	(95)	2.64000E+05	412.00	(145)	2.41000E+05	415.90	(145)	2.41000E+05	415.90	(145)	2.41000E+05	415.90
(46)	63600.	400.64	(96)	2.60000E+05	411.80	(146)	2.30000E+05	415.20	(146)	2.30000E+05	415.20	(146)	2.30000E+05	415.20
(47)	73600.	400.96	(97)	2.65000E+05	411.30	(147)	2.37000E+05	415.10	(147)	2.37000E+05	415.10	(147)	2.37000E+05	415.10
(48)	1.09000E+05	403.66	(98)	3.40000E+05	410.90	(148)	2.41000E+05	418.90	(148)	2.41000E+05	418.90	(148)	2.41000E+05	418.90
(49)	1.18000E+05	405.07	(99)	3.48000E+05	410.40	(149)	2.48000E+05	419.40	(149)	2.48000E+05	419.40	(149)	2.48000E+05	419.40
(50)	1.64000E+05	407.61	(100)	3.48000E+05	410.20	(150)	2.48000E+05	419.70	(150)	2.48000E+05	419.70	(150)	2.48000E+05	419.70

Table 2.2. Continued.

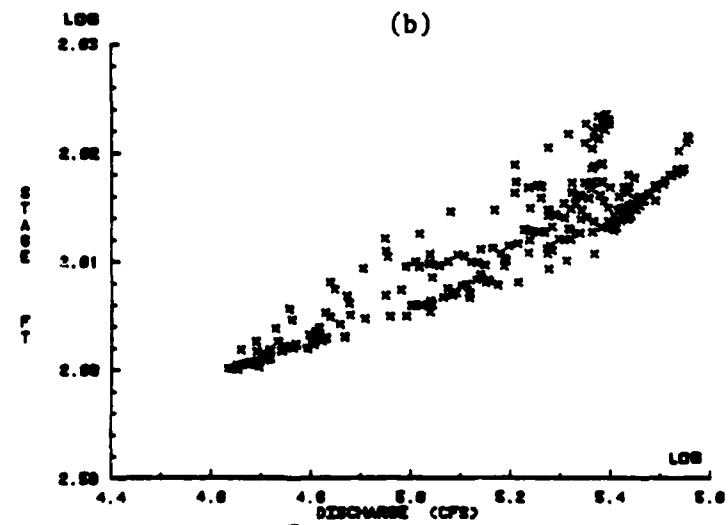
STAGE DISCHARGE HYDROGRAPH AT HARTFORD			STAGE DISCHARGE HYDROGRAPH AT HARTFORD		
INDEX	DISCHARGE	ELEVATION	INDEX	DISCHARGE	ELEVATION
(151)	2.43000E+05	419.60	(180)	2.39000E+05	413.10
(152)	2.36000E+05	419.10	(181)	2.30000E+05	414.30
(153)	2.31000E+05	418.20	(182)	2.27000E+05	415.00
(154)	2.22000E+05	417.70	(183)	2.10000E+05	413.40
(155)	2.32000E+05	418.00	(184)	1.82000E+05	412.90
(156)	2.41000E+05	419.00	(185)	1.89000E+05	411.80
(157)	2.45000E+05	420.30	(186)	1.73000E+05	412.00
(158)	2.36000E+05	420.10	(187)	1.47000E+05	411.80
(159)	2.23000E+05	419.40	(188)	1.38000E+05	408.40
(160)	2.05000E+05	418.50	(189)	1.46000E+05	408.50
(161)	1.88000E+05	417.30	(190)	1.57000E+05	408.70
(162)	1.61000E+05	415.80	(191)	1.73000E+05	409.20
(163)	1.62000E+05	414.30	(192)	1.85000E+05	409.90
(164)	1.72000E+05	413.80	(193)	1.81000E+05	409.90
(165)	1.82000E+05	413.90	(194)	2.07000E+05	410.20
(166)	1.79000E+05	414.00	(195)	2.85000E+05	411.20
(167)	1.61000E+05	413.30	(196)	2.48000E+05	412.00
(168)	1.20000E+05	411.70	(197)	2.61000E+05	413.00
(169)	88700.	408.40	(198)	2.71000E+05	413.40
(170)	1.09000E+05	408.00	(199)	2.73000E+05	413.90
(171)	1.02000E+05	407.40	(200)	2.50000E+05	412.80
(172)	1.04000E+05	406.00	(201)	2.62000E+05	412.40
(173)	1.14000E+05	407.00	(202)	1.79000E+05	410.10
(174)	1.32000E+05	407.30	(203)	1.64000E+05	408.00
(175)	1.28000E+05	407.80	(204)	1.51000E+05	408.00
(176)	1.19000E+05	407.40	(205)	1.41000E+05	407.00
(177)	1.09000E+05	407.20	(206)	1.35000E+05	406.80
(178)	1.35000E+05	407.20	(207)	1.25000E+05	405.30
(179)	2.18000E+05	409.00	(208)	1.23000E+05	404.70
(209)	1.09000E+05	404.00	(210)	1.10000E+05	403.70
(210)	1.10000E+05	403.70	(211)	1.01000E+05	403.60
(211)	1.05000E+05	403.60	(212)	1.05000E+05	403.60
(212)	1.31000E+05	404.20	(213)	1.49000E+05	405.30
(213)	1.49000E+05	405.30	(214)	1.41000E+05	405.50
(214)	1.41000E+05	405.50	(215)	1.43000E+05	405.70
(215)	1.43000E+05	405.70	(216)	1.21000E+05	404.50
(216)	1.21000E+05	404.50	(217)	98800.	403.60
(217)	98800.	403.60	(218)	98800.	402.70
(218)	98800.	402.70	(219)	80900.	402.50
(219)	80900.	402.50	(220)	75400.	402.80
(220)	75400.	402.80	(221)	89000.	408.30
(221)	89000.	408.30	(222)	1.04000E+05	409.80
(222)	1.04000E+05	409.80	(223)	89700.	407.80
(223)	89700.	407.80	(224)	80100.	406.80
(224)	80100.	406.80	(225)	76300.	405.00
(225)	76300.	405.00	(226)	56900.	403.30
(226)	56900.	403.30	(227)	67300.	403.00
(227)	67300.	403.00	(228)	57700.	402.40
(228)	57700.	402.40	(229)	53500.	401.60
(229)	53500.	401.60	(230)	62500.	401.10
(230)	62500.	401.10	(231)	72000.	402.00
(231)	72000.	402.00	(232)	97800.	402.70
(232)	97800.	402.70	(233)	1.16000E+05	404.30
(233)	1.16000E+05	404.30	(234)	1.10000E+05	405.00
(234)	1.10000E+05	405.00	(235)	64800.	405.60
(235)	64800.	405.60	(236)	71300.	404.40
(236)	71300.	404.40	(237)		



(a)



(b)



(c)

Figure 2.2. Stage-discharge relations at Hartford, Illinois.

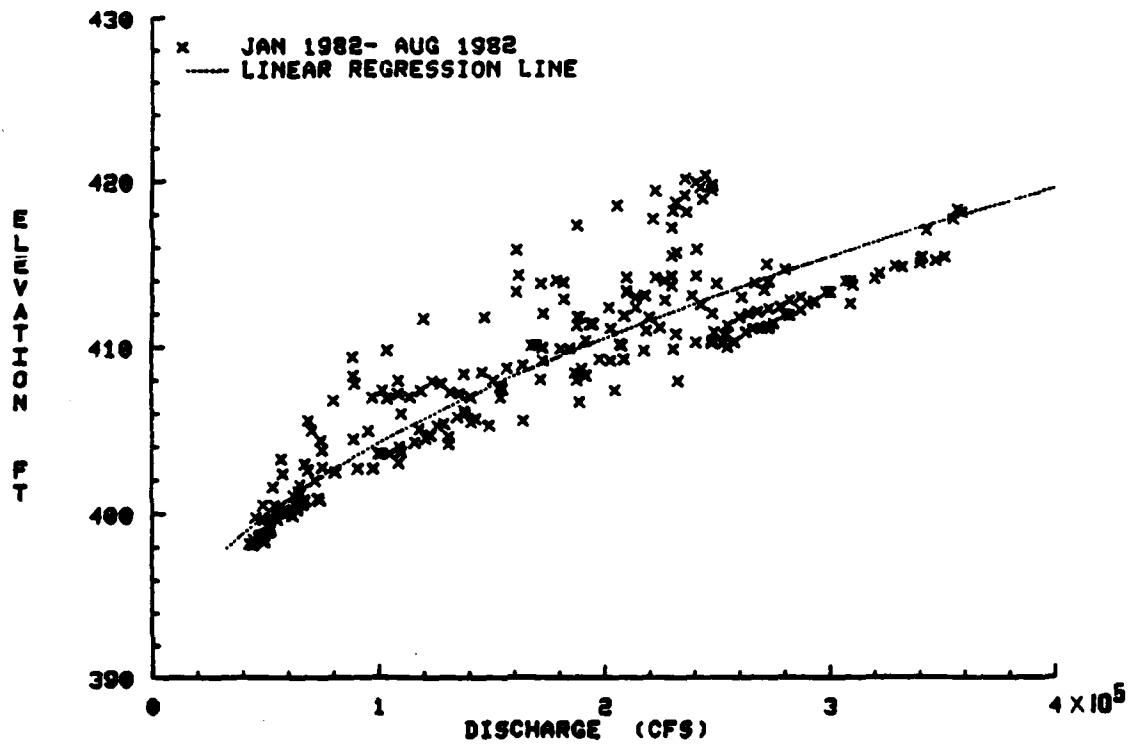


Figure 2.3a. Stage-discharge relations at Hartford, Illinois.

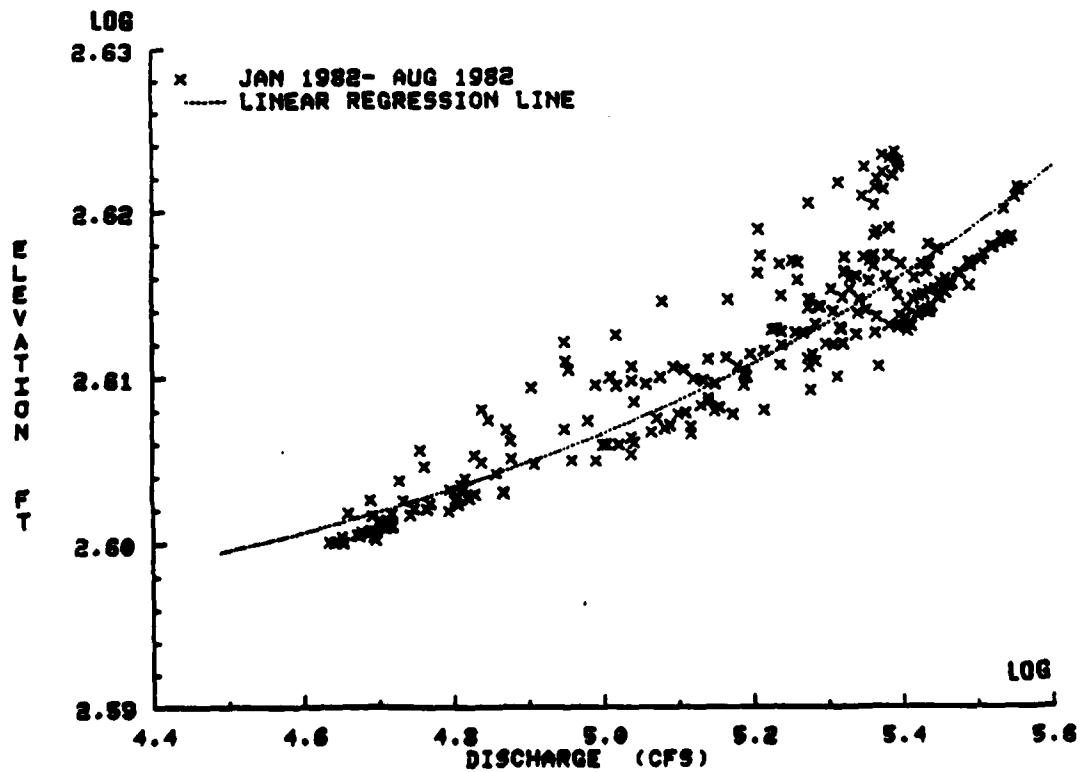


Figure 2.3b. Stage-discharge relations at Hartford, Illinois.

reproduce the flows of January through April 1982 should be questioned. For the simulation of the existing conditions at Lock and Dam No. 26 Replacement (Stage 1) the use of the actual discharges was preferable. The model verification runs were carried out by using daily discharges at Alton, Illinois and the corresponding water surface elevations at Hartford, Illinois as the downstream boundary conditions. The days where water surface elevations at Hartford, Illinois were not measured or were questionable as indicated in the log-sheets were eliminated in generating the input data.

2.2 Cross Section Data

The cross section data consists of the initial cross section data (13 May 1977) and of the existing cross section data at Lock and Dam No. 26 Replacement (Stage 1). The initial cross sectional data encompasses 13 cross section between RM 196.3 and RM 202.7. The existing cross section data at Lock and Dam No. 26 replacement consists of 7 randomly spaced cross sections along the cofferdam.

The stations used to obtain initial cross-sectional data (May 1977 soundings) are given in Table 2.3. Table 2.4 presents the stations used to study the scouring at the Phase 1 cofferdam site and Table 2.5 gives the location and the thalweg elevations of cross sections selected to describe January 1982 conditions along the study reach.

Due to the lack of channel cross-section measurements away from the immediate vicinity of the Phase 1 cofferdam, channel cross-sections measured in May 1977 were decided to be representative of the initial channel conditions in January 1982 away from the cofferdam.

2.2.1 Initial Cross-Section Data (13 May 1977)

The channel bed configuration is obtained from the Hydrologic Survey maps of the Mississippi River (River mile 202 to mile 300). The

Table 2.3. Cross sections obtained from May 1977 soundings.

Station Number	River Mile	Distance from Alton, Ill. (Miles)	Thalweg Elevation (ft)
1	202.7	0.0	345
2	202.5	0.2	380
3	202.3	0.4	383
4	202.1	0.6	383
5	201.9	0.8	369
6	201.7	1.0	372
7	201.5	1.2	370
8	201.3	1.4	374
9	201.1	1.6	370
10	200.9	1.8	368
11	200.7	2.0	367
12	200.5	2.2	369
13	200.3	2.4	368
14	199.3	2.6	363
15	196.8	5.9	366

Table 2.4. Cross sections measured in January, April, August 1982 of the Lock and Dam No. 26 (Replacement) Site

Station Number	River Mile	Distance from Alton, Ill. (Miles)	Thalweg Elevation (ft)
1	201.0	1.7	365
2	200.92	1.78	345
3	200.88	1.82	340
4	200.79	1.91	350
5	200.72	1.98	360
6	200.63	2.07	360
7	200.47	2.23	360

Table 2.5. Summary of stations used in describing the January 1982 channel cross sections along the study reach.

Station Number	River Mile	Distance from Alton, Ill. (Miles)	Thalweg Elevation (ft)	Date of Sounding
1	202.7	0.0	345	May '77
2	202.5	0.2	380	May '77
3	202.3	0.4	383	May '77
4	202.1	0.6	383	May '77
5	201.9	0.8	369	May '77
6	201.7	1.0	372	May '77
7	201.5	1.2	370	May '77
8	201.3	1.4	374	May '77
9	201.0	1.7	365	Jan '82
10	200.92	1.78	345	Jan '82
11	200.88	1.82	340	Jan '82
12	200.79	1.91	350	Jan '82
13	200.72	1.98	360	Jan '82
14	200.63	2.07	360	Jan '82
15	200.47	2.23	360	Jan '82
16	200.30	2.4	368	May '77
17	199.30	3.4	363	May '77
18	196.80	5.9	366	May '77

plate of interest is plate No. 74 which contains channel bed soundings for cross sections between River mile 200 and 202.9. The date of soundings is May 13, 1977. These soundings are assumed representative for the initial conditions because the particular river reach is considered stable (verbal communication with Mr. Charles Denzel).

The information contained on plate No. 74 is not sufficient to define a complete cross section. Location and elevations of banks and levees are not indicated. Large scale topographic maps for the given river reach have been provided by the Corps of Engineers, St. Louis District.

The cross sections were located on the topographic maps by using a coordinate system common to plate No. 74 and the topographic maps. Performing a proper scale transformation, the location of the contour lines of interest were transposed on plate No. 74 and the cross sectional data was completed. Figure 2.4 shows the river reach of interest with all cross-sectional information.

The origin of the horizontal axis across the channel has been arbitrarily selected at the 430 [ft] contour line on the left bank looking downstream. It should be noted that the 430 ft contour line is not available for the right bank because of the flood plain. For the present study, the flow on the flood plain is not of interest and will be neglected.

Table 2.6 lists the May 1977 cross-sectional data to be used as the initial conditions and Figure 2.5 shows plots of these cross sections. The irregularities in the cross section at river mile 202.7 are thought to be due to local scour behind the pier of the Clark Highway Bridge.

Figure 2.6 shows a plot of the thalweg between river mile 196.8 and 202.7.

Figure 2.4. Plate No. 74

Table 2.6. May 1977 cross-sectional data to be used as the initial conditions between River Miles 196.8 and 202.7.

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 202.7					
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0	430.00	(15)	2189.0	351.00
(2)	277.00	420.00	(16)	2311.0	354.00
(3)	494.00	410.00	(17)	2341.0	352.00
(4)	731.00	379.00	(18)	2432.0	362.00
(5)	1050.0	370.00	(19)	2550.0	410.00
(6)	1187.0	384.00	(20)	2680.0	420.00
(7)	1311.0	350.00	(21)	2953.0	430.00

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 202.5					
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0	430.00	(11)	2473.0	385.00
(2)	227.00	420.00	(12)	2625.0	390.00
(3)	383.00	410.00	(13)	2752.0	390.00
(4)	1020.0	390.00	(14)	2898.0	385.00
(5)	1258.0	380.00	(15)	2959.0	394.00
			(16)	3720.0	410.00
			(17)	4066.0	420.00

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 202.3					
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0	430.00	(13)	2188.0	385.00
(2)	76.000	420.00	(14)	2329.0	385.00
(3)	410.00	410.00	(15)	2431.0	383.00
(4)	729.00	388.00	(16)	2537.0	388.00
(5)	895.00	390.00	(17)	2658.0	388.00
(6)	942.00	385.00	(18)	3068.0	410.00
			(19)	3114.0	420.00

Table 2.6. Continued.

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 202.1				
INDEX	HOR. DIST	ELEVATION	INDEX	ELEVATION
(1)	0.	439.00	(8)	383.00
(2)	91.000	439.00	(9)	383.00
(3)	243.00	418.00	(10)	385.00
(4)	364.00	418.00	(11)	383.00
(5)	623.00	399.00	(12)	388.00
(6)	774.00	384.00	(13)	385.00
(7)	896.00	385.00	(14)	388.00
			(15)	386.00
			(16)	391.00
			(17)	388.00
			(18)	389.00
			(19)	402.00
			(20)	418.00
			(21)	419.00
			(22)	419.00

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 201.9				
INDEX	HOR. DIST	ELEVATION	INDEX	ELEVATION
(1)	0.	439.00	(8)	375.00
(2)	79.000	439.00	(9)	374.00
(3)	259.00	418.00	(10)	384.00
(4)	441.00	394.00	(11)	385.00
(5)	547.00	378.00	(12)	383.00
(6)	654.00	369.00	(13)	387.00
(7)	790.00	377.00	(14)	382.00
			(15)	389.00
			(16)	387.00
			(17)	378.00
			(18)	388.00
			(19)	385.00
			(20)	410.00
			(21)	418.00

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 201.7				
INDEX	HOR. DIST	ELEVATION	INDEX	ELEVATION
(1)	0.	439.00	(8)	378.00
(2)	91.000	439.00	(9)	378.00
(3)	334.00	418.00	(10)	373.00
(4)	395.00	402.00	(11)	388.00
(5)	596.00	399.00	(12)	382.00
			(13)	382.00
			(14)	382.00
			(15)	382.00
			(16)	382.00
			(17)	382.00
			(18)	382.00
			(19)	382.00
			(20)	382.00
			(21)	382.00
			(22)	382.00

Table 2.6. Continued.

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM			201.5		
INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION
(1)	0.	430.00	(11)	1945.0	376.00
(2)	76.000	428.00	(12)	2081.0	373.00
(3)	379.000	410.00	(13)	2157.0	369.00
(4)	760.000	371.00	(14)	2234.0	410.00
(5)	943.00	372.00	(15)	2294.0	416.00

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 201.3			
INDEX	MOR. DIST	ELEVATION	
(1)	0	429.00	
(2)	78.000	428.00	
(3)	274.00	418.00	
(4)	319.00	405.00	
(5)	542.00	397.00	
(6)	613.00	379.00	
(7)	881.00	379.00	
(8)	1083.0	378.00	
(9)	1355.0	377.00	
(10)	1383.0	378.00	
(11)	1525.0	378.00	
(12)	1611.0	378.00	
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(14)			
(15)			
(16)			
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(98)			
(99)			
(100)			

CROSS-SECTION DATA FOR MISSISSIPPI RIVER AT 201.1			
INDEX	MOR. DIST	ELEVATION	
(1)	0.	428.00	
(2)	46.000	428.00	
(3)	243.00	410.00	
(4)	368.00	390.00	
(5)	638.00	370.00	
INDEX MOR. DIST		ELEVATION	
(6)	775.00	373.00	
(7)	842.00	370.00	
(8)	1064.0	370.00	
(9)	1216.0	377.00	
(10)	1246.0	375.00	
INDEX	MOR. DIST	ELEVATION	
(11)	1393.0	381.00	
(12)	1641.0	382.00	
(13)	1823.0	386.00	
(14)	1975.0	391.00	
(15)	2128.0	410.00	
(16)	2310.0	414.00	

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM				200 9	
INDEX	NOR. DIST	ELEVATION	INDEX	NOR. DIST	ELEVATION
(1)	0	430.00	(7)	699.00	372.00
(2)	61.000	428.00	(8)	821.00	372.00
(3)	122.00	410.00	(9)	912.00	368.00
(4)	213.00	390.00	(10)	1044.0	375.00
(5)	335.00	372.00	(11)	1195.0	377.00
(6)	578.00	368.00	(12)	1337.0	373.00
			(13)	1535.0	381.00
			(14)	1809.0	386.00
			(15)	1846.0	392.00
			(16)	1732.0	400.00
			(17)	1808.0	410.00
			(18)	1899.0	415.00

Table 2.6. Continued.

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 199.3				
INDEX	HOR. DIST	ELEVATION	INDEX	ELEVATION
(1)	0	445.50	(11)	398.50
(2)	100.00	428.00	(12)	405.00
(3)	475.00	425.00	(13)	398.00
(4)	515.00	401.00	(14)	401.00
(5)	850.00	369.00	(15)	414.00
			(16)	415.00
			(17)	434.20
CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 196.8				
INDEX	HOR. DIST	ELEVATION	INDEX	ELEVATION
(1)	625.00	423.50	(15)	379.00
(2)	650.00	413.00	(16)	355.00
(3)	1625.0	418.50	(17)	365.00
(4)	1950.0	416.50	(18)	400.30
(5)	2050.0	413.50	(19)	411.30
(6)	2200.0	391.00	(20)	411.00
(7)	2400.0	386.50	(21)	423.00

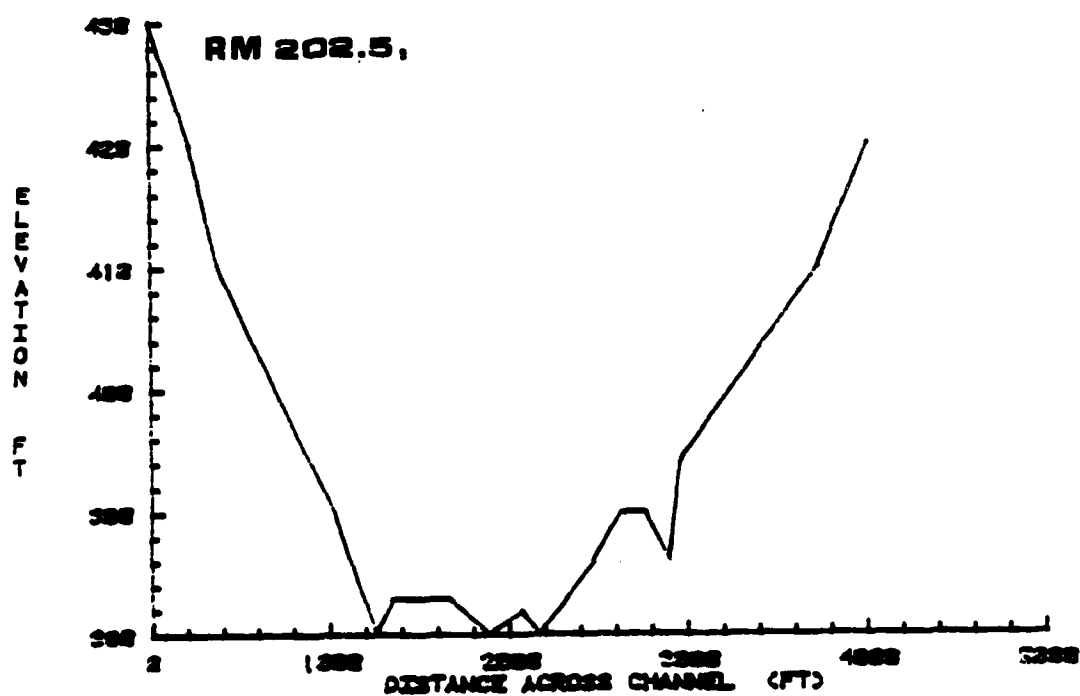
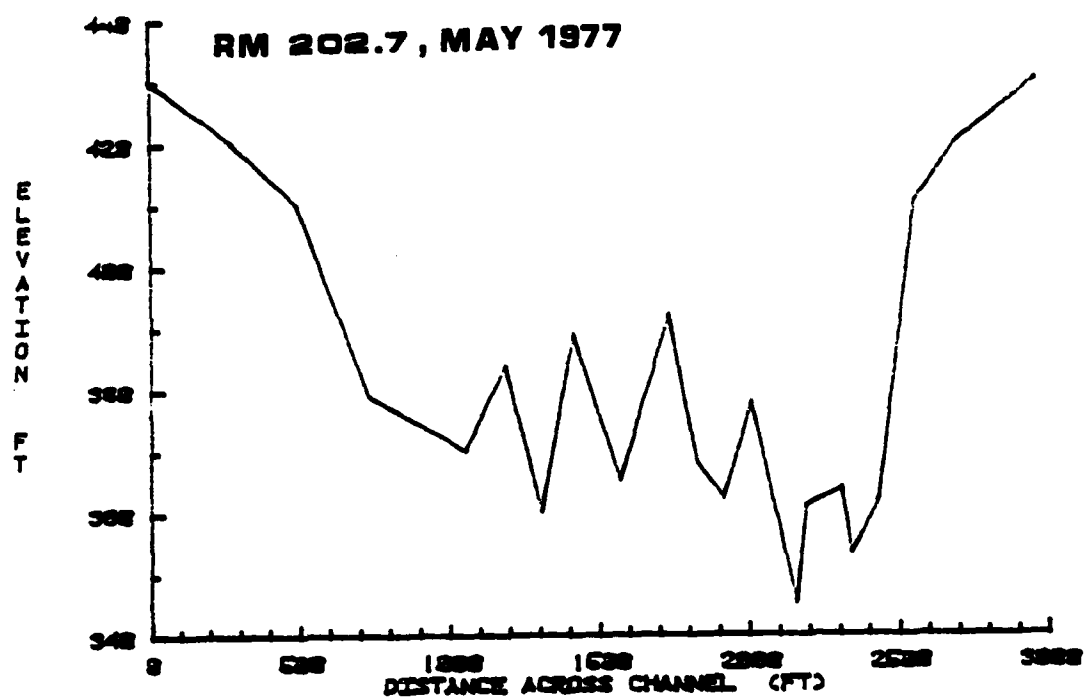


Figure 2.5. Cross section plots for Mississippi River between RM 196.8 and RM 202.7. The date of soundings is May 1977.

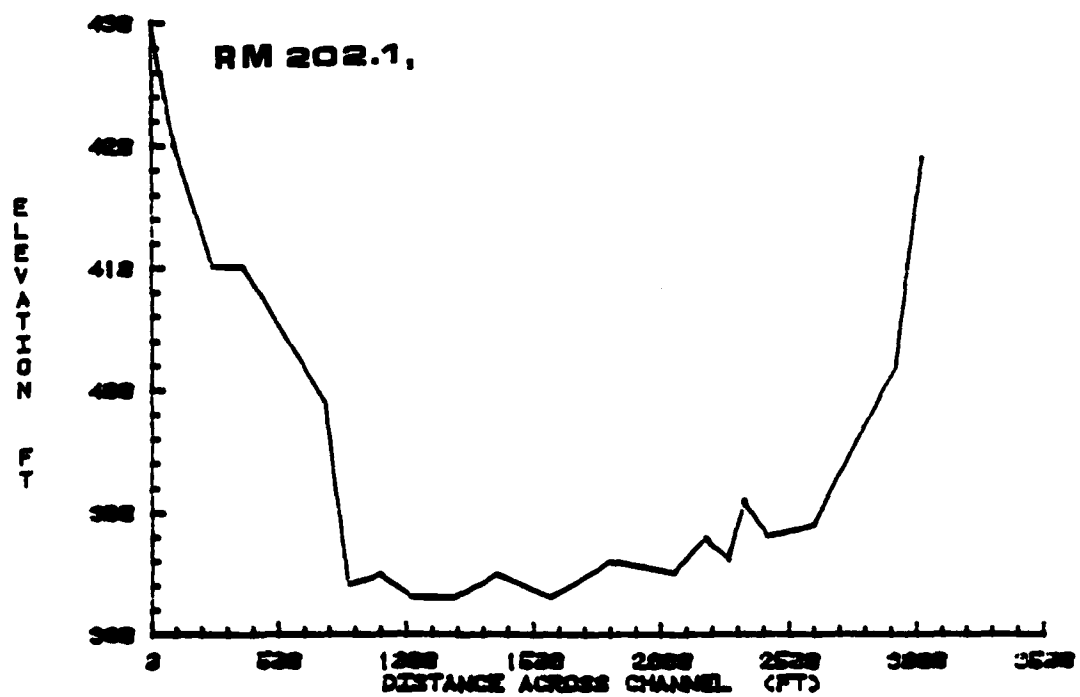
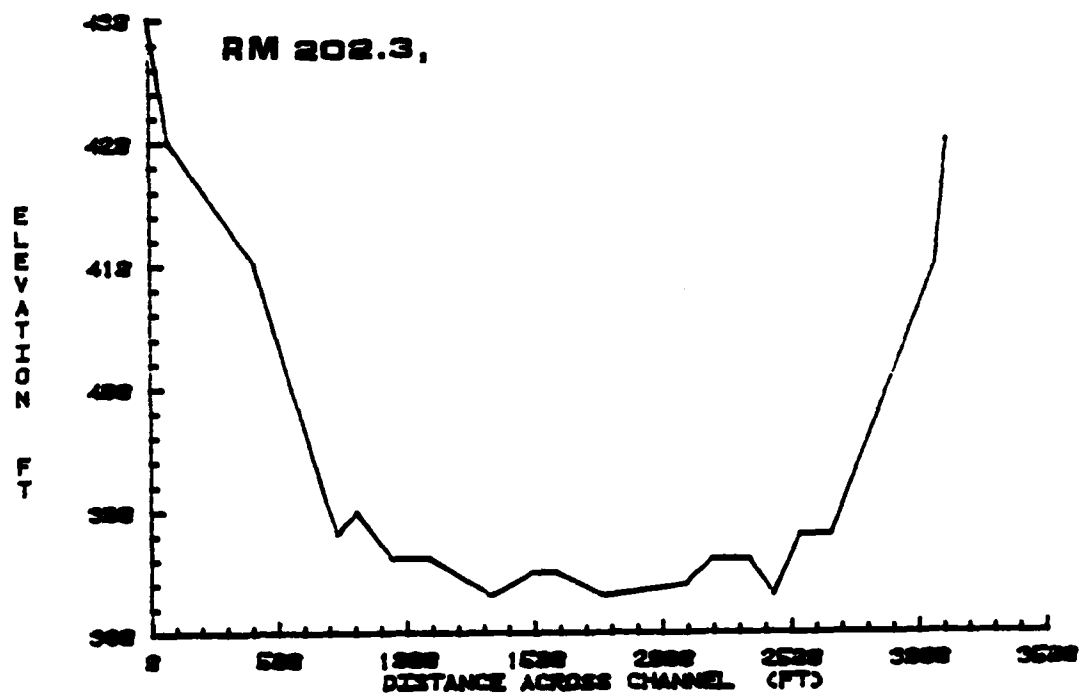


Figure 2.5. Continued.

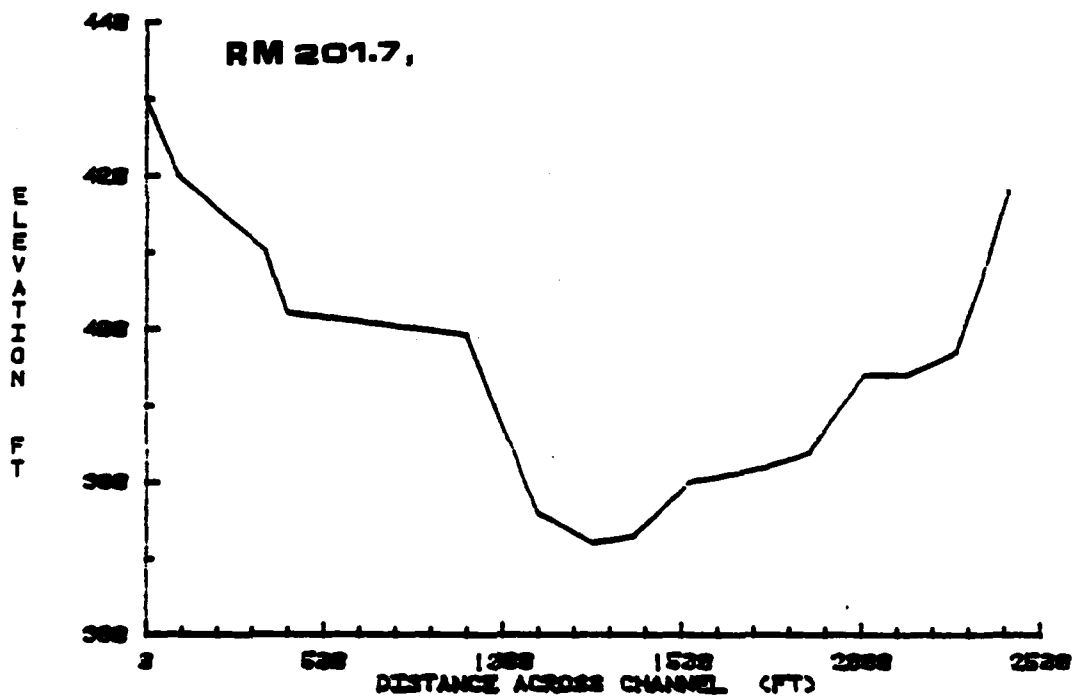
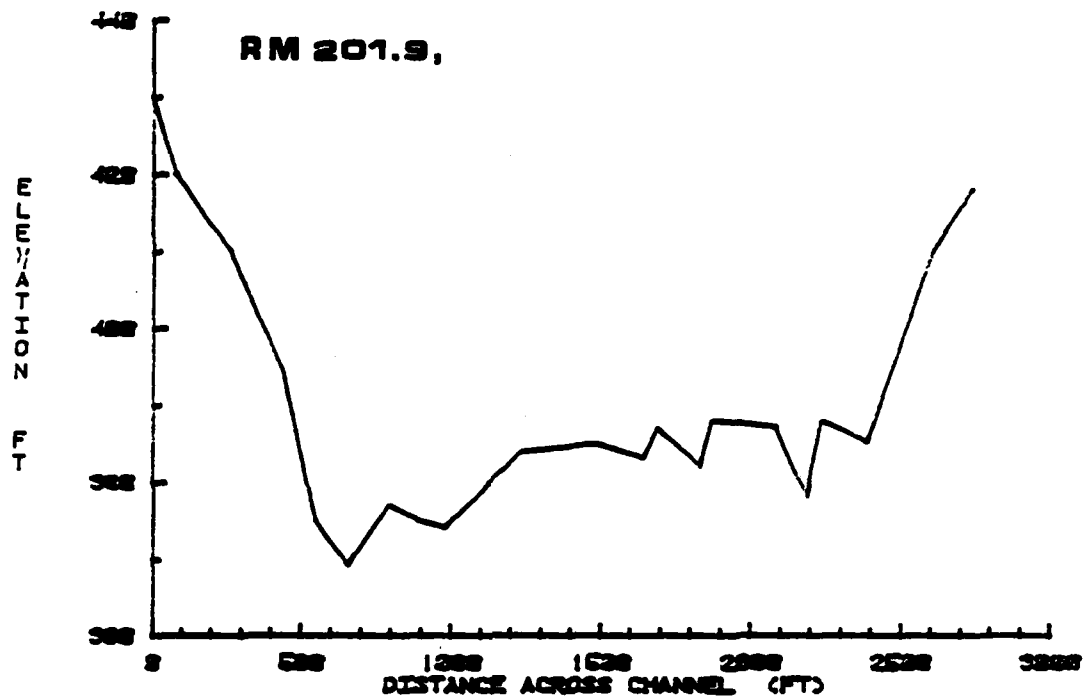


Figure 2.5. Continued.

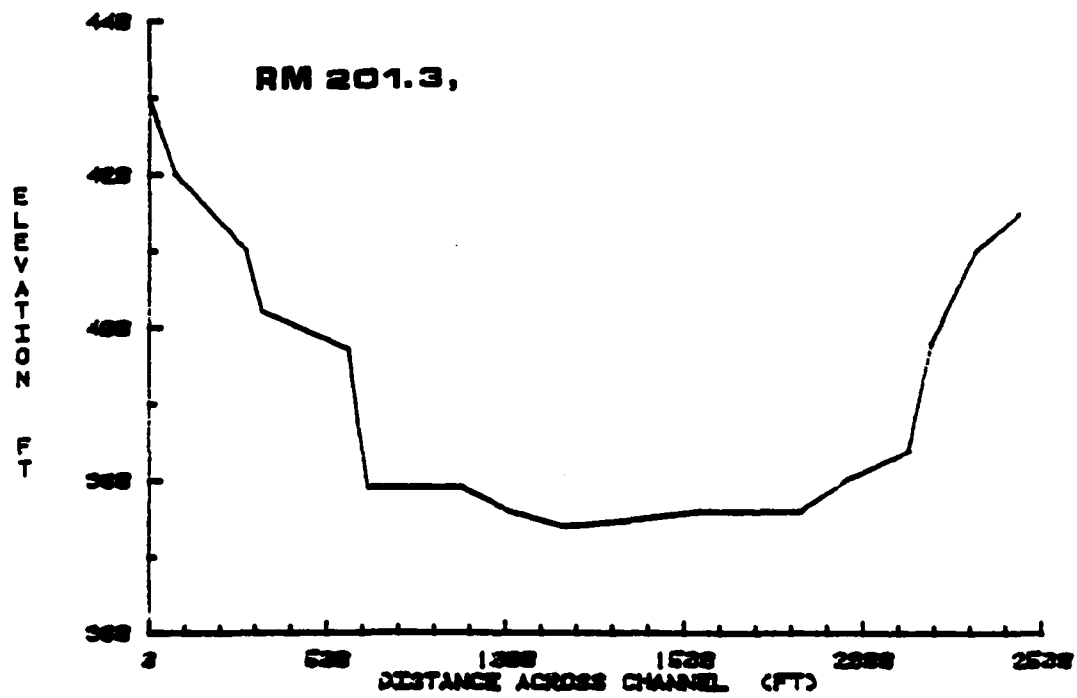
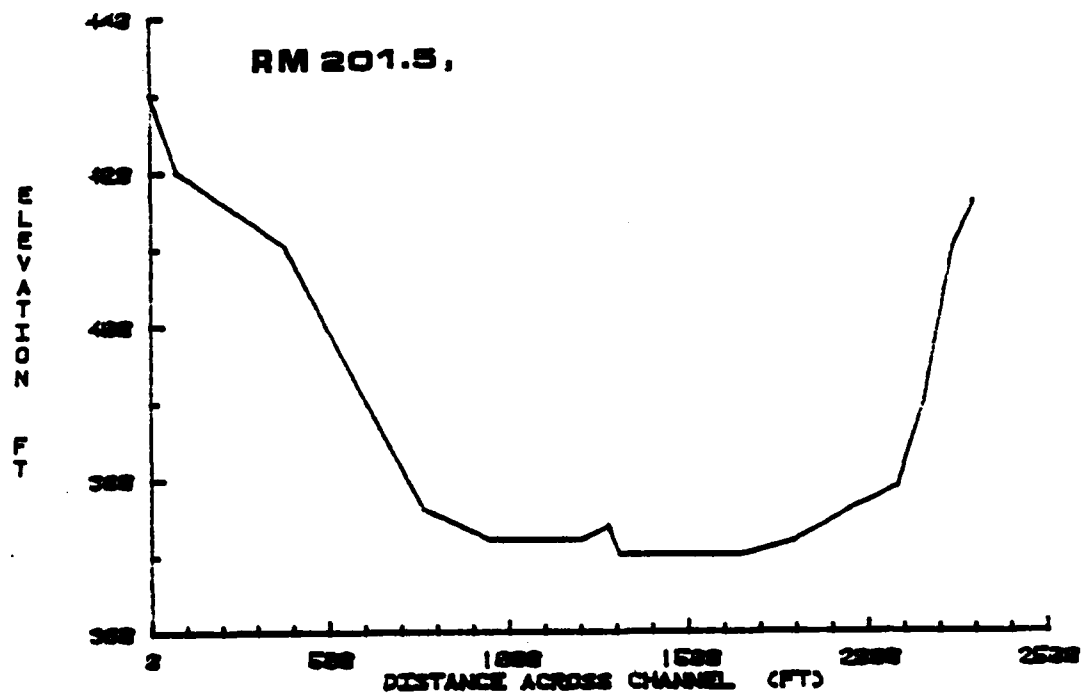


Figure 2.5. Continued.

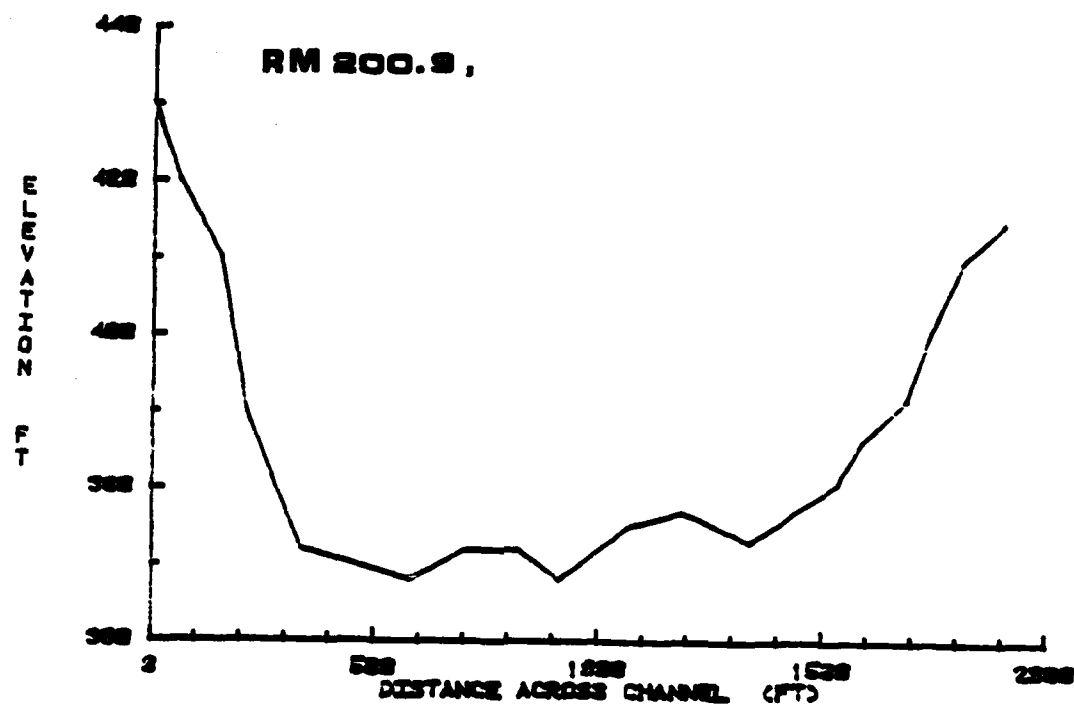
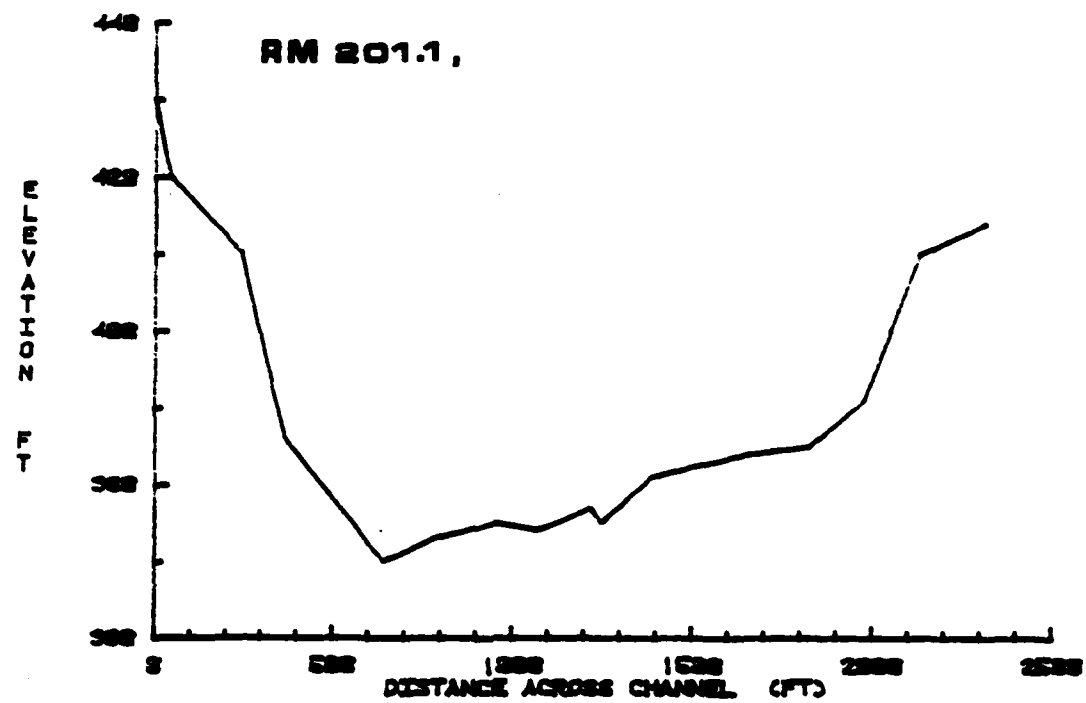


Figure 2.5. Continued.

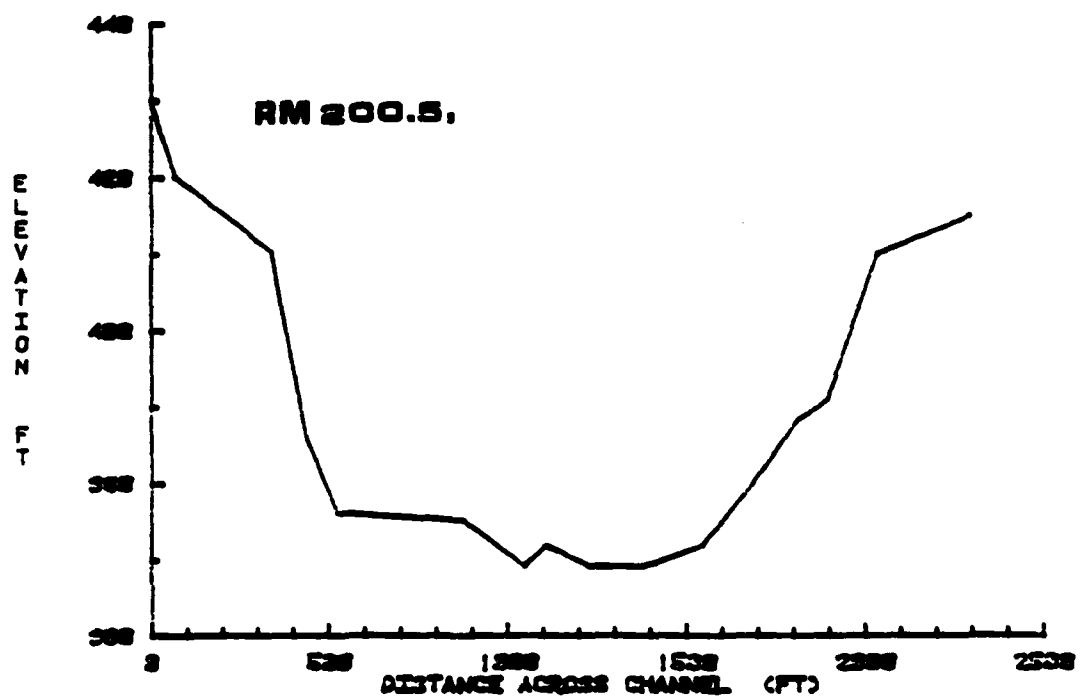
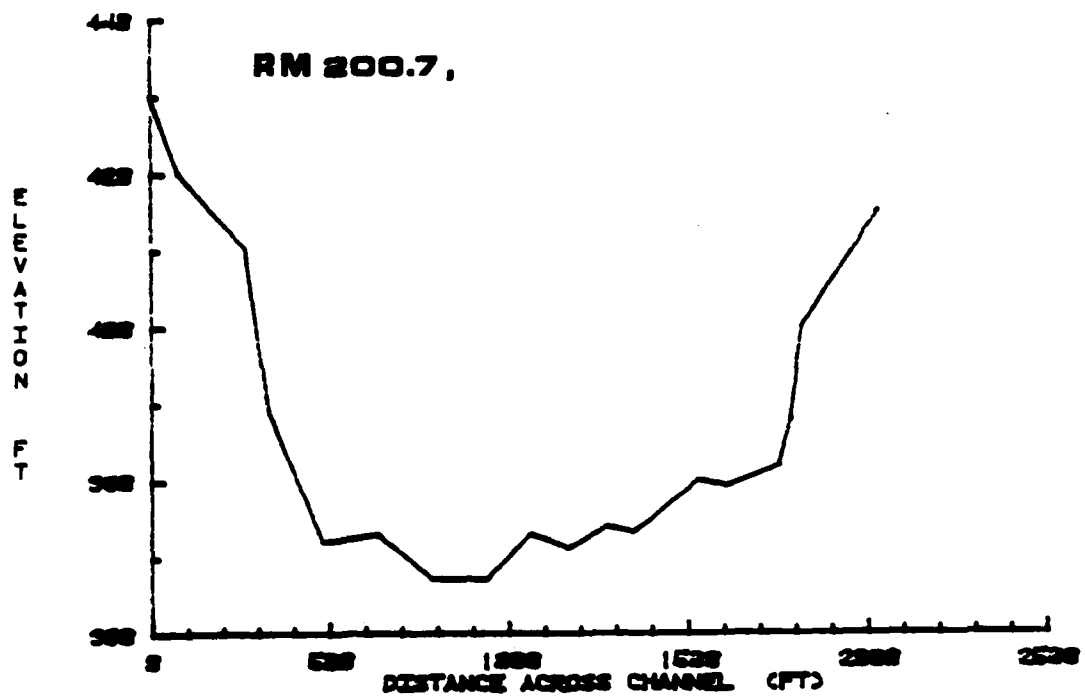


Figure 2.5. Continued.

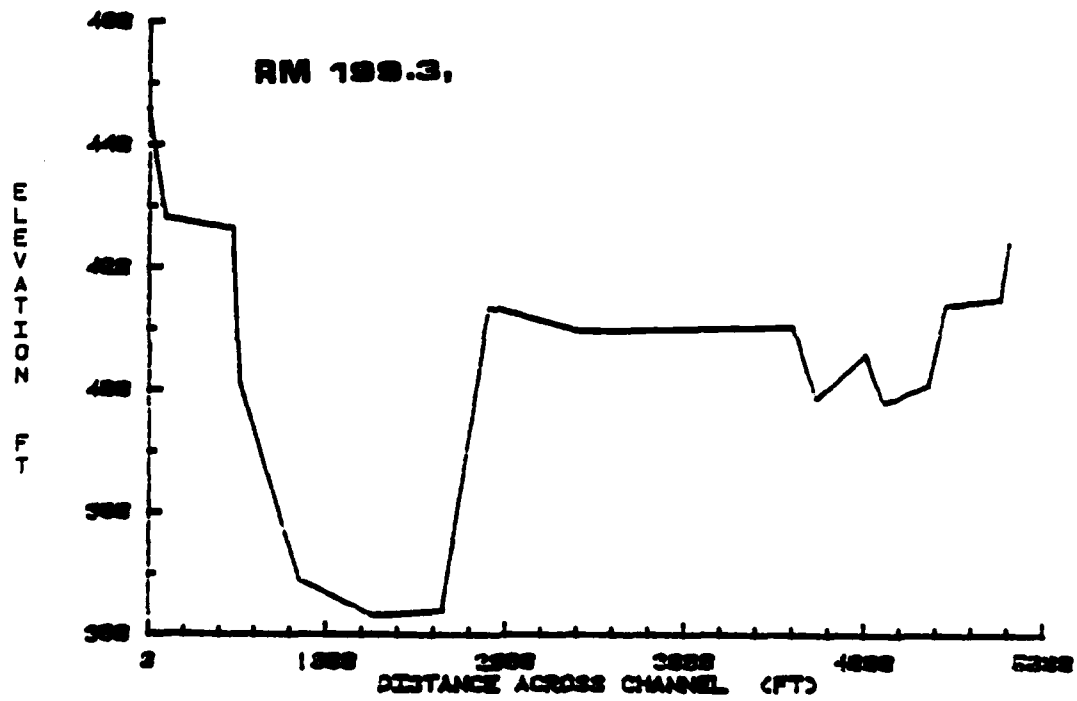
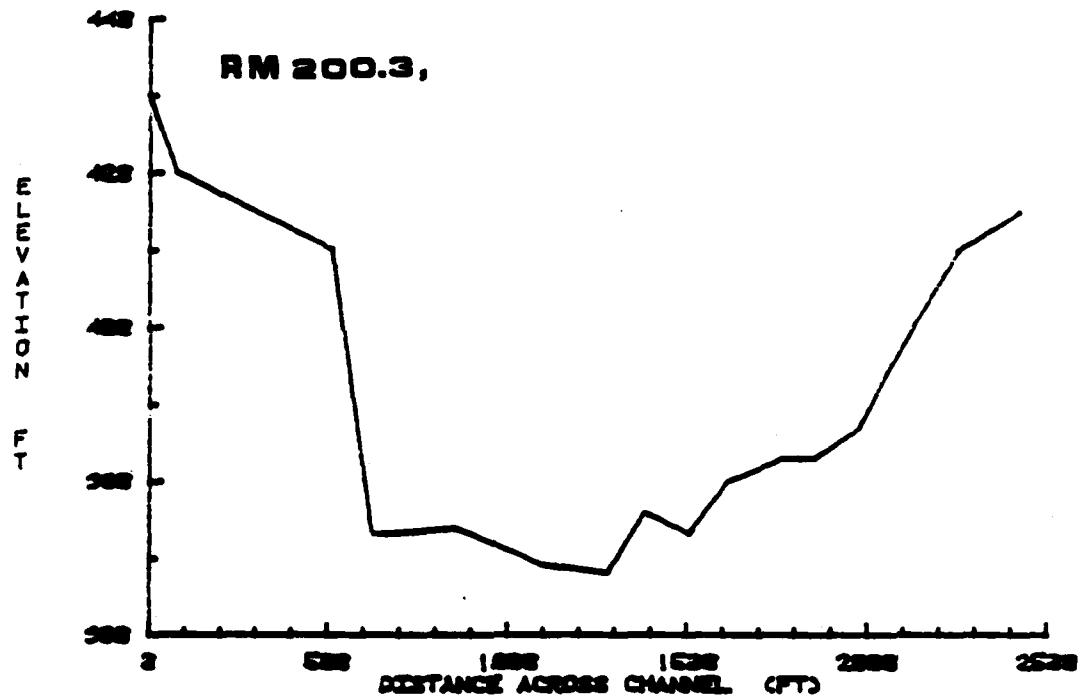


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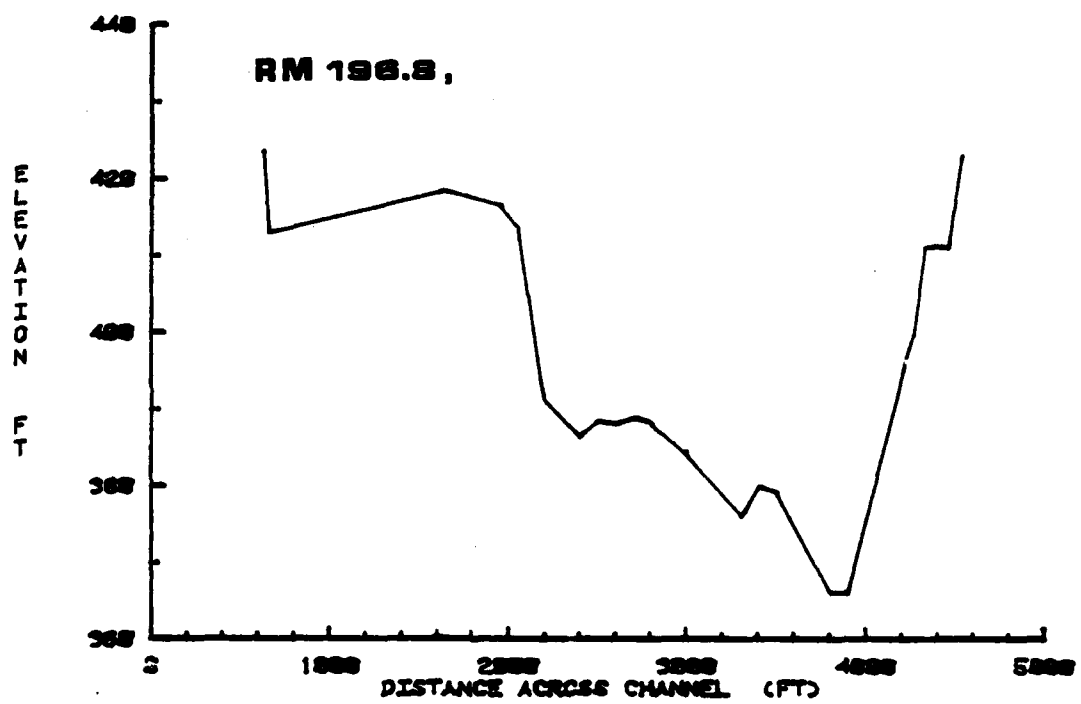


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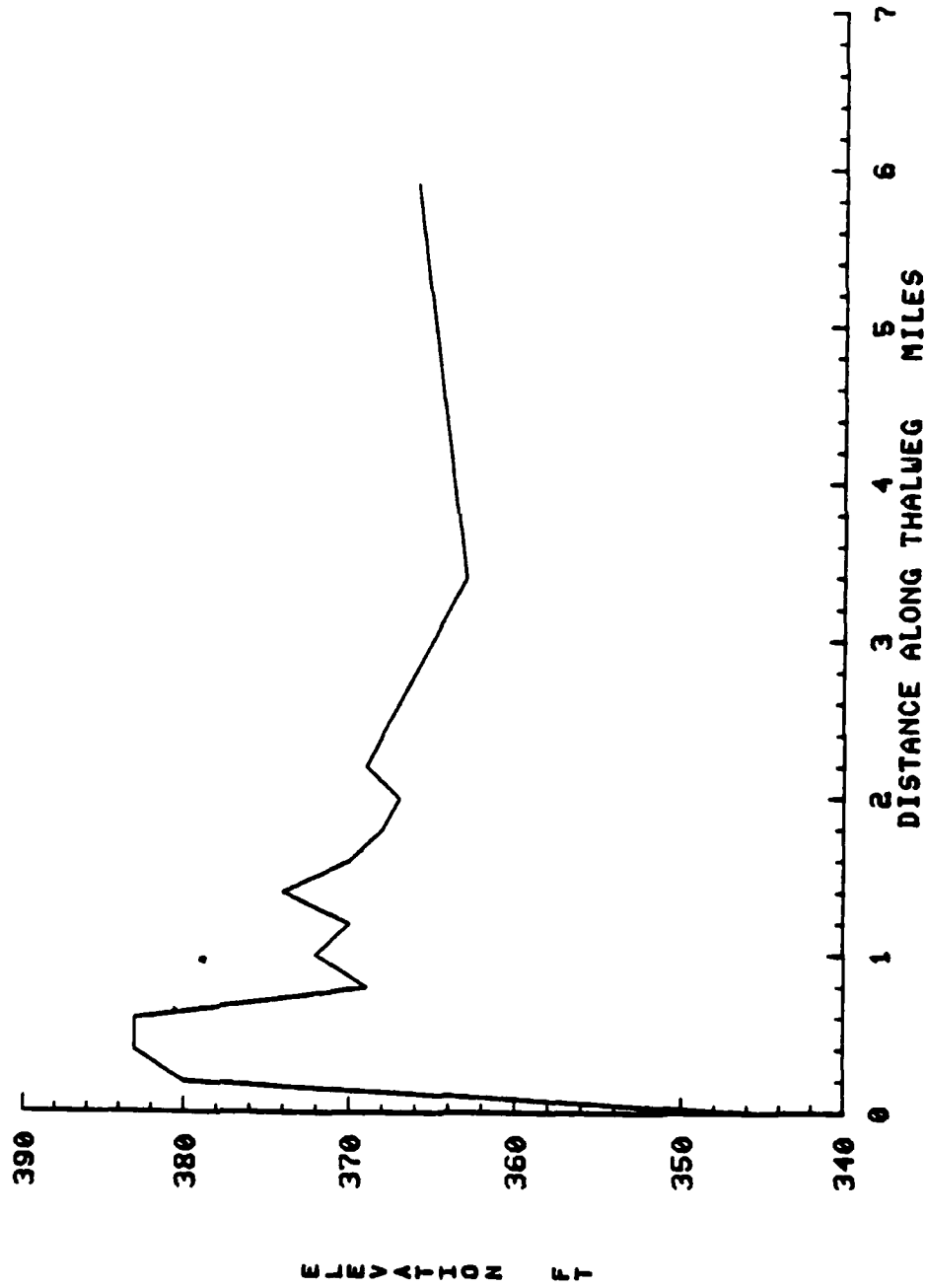


Figure 2.6. Thalweg of the Mississippi River between RM 196.8 and RM 202.7 (January 1977).

2.2.2 Cross Section Data along Lock and Dam No. 26 Replacement (1982)

To calibrate and test the stream tube model, scour surveys at Lock and Dam No. 26 Replacement are used to determine the progression and magnitude of the local erosion. Three scour survey maps (Scale 1"=100') are available, namely for January 22, 1982, April 29, 1982 and August 9, 1982. Figure 2.7 shows these three maps. On these maps the contour lines for every 5 ft are indicated and they are used to define the cross section. The location of the bank and levee are not indicated and again they are obtained from the topographical maps. To superpose the information from both maps, the same procedure as used for the initial cross sections is applied. Figure 2.8 shows the reach of interest and contains all information pertinent to the cross sections along Lock and Dam No. 26 replacement.

Table 2.7 lists the final cross sectional data for the 7 cross sections for January 22, April 26 and August 9, 1982. Figure 2.9 shows plots of these cross sections. The origin of the horizontal axis across the channel has been arbitrarily selected at the 430 (ft) contour line on the left bank looking downstream. On the right side the cross section is defined by the cofferdam of Lock and Dam No. 26 Replacement (Phase 1). The scouring activity at the Lock and Dam No. 26 Replacement site can be observed from the superposed cross-sections given in Figure 2.10. In the next phase of the study the data presented in this figure will be used for comparison between the measured and computed channel cross sections for Phase 1 cofferdam. Starting with January 1982 cross sections, the water and sediment routing computer program will be used to compute February, March, and April 1982 cross sections. These cross

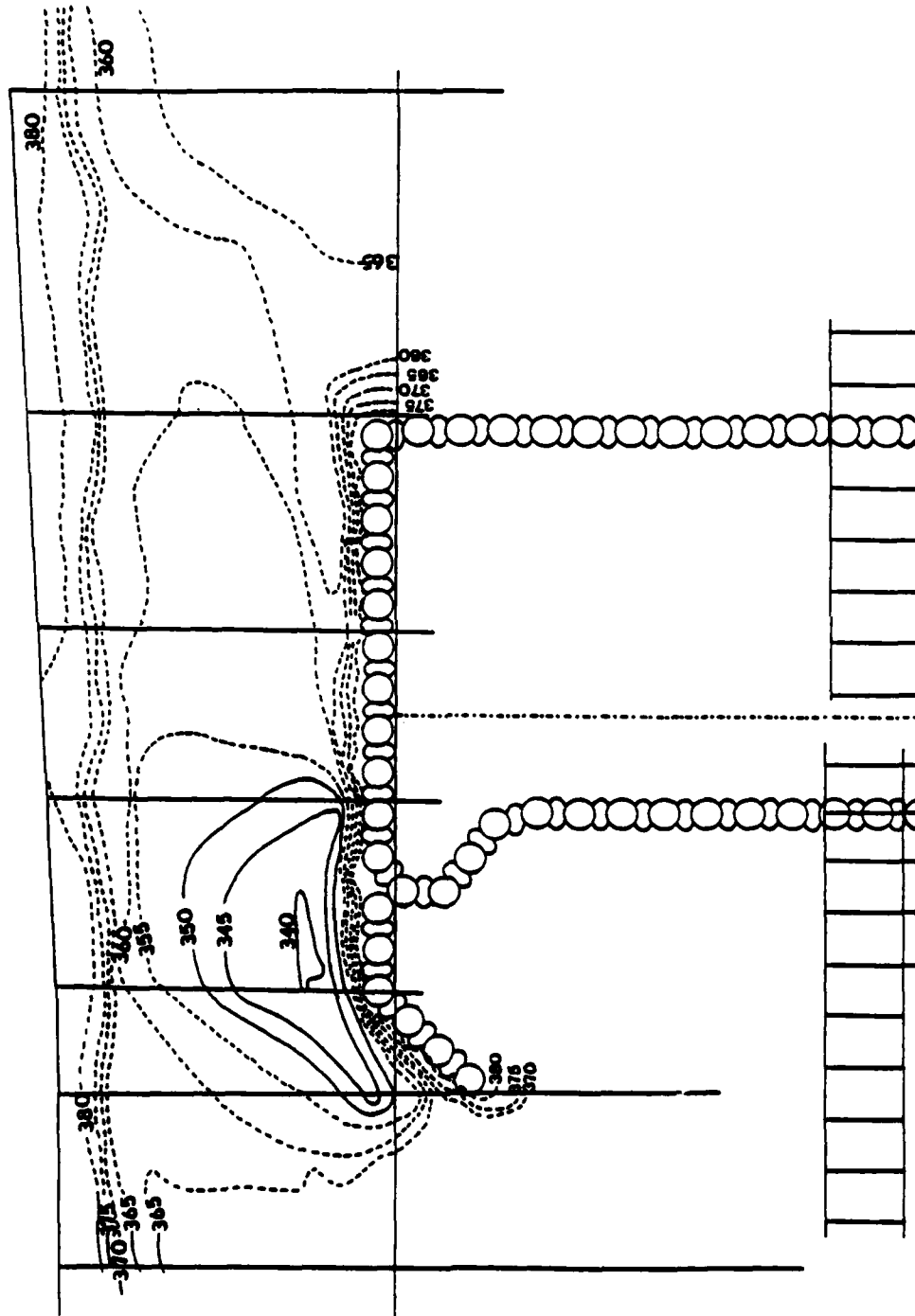


Figure 2.7(a). Scour survey map (January 1982).

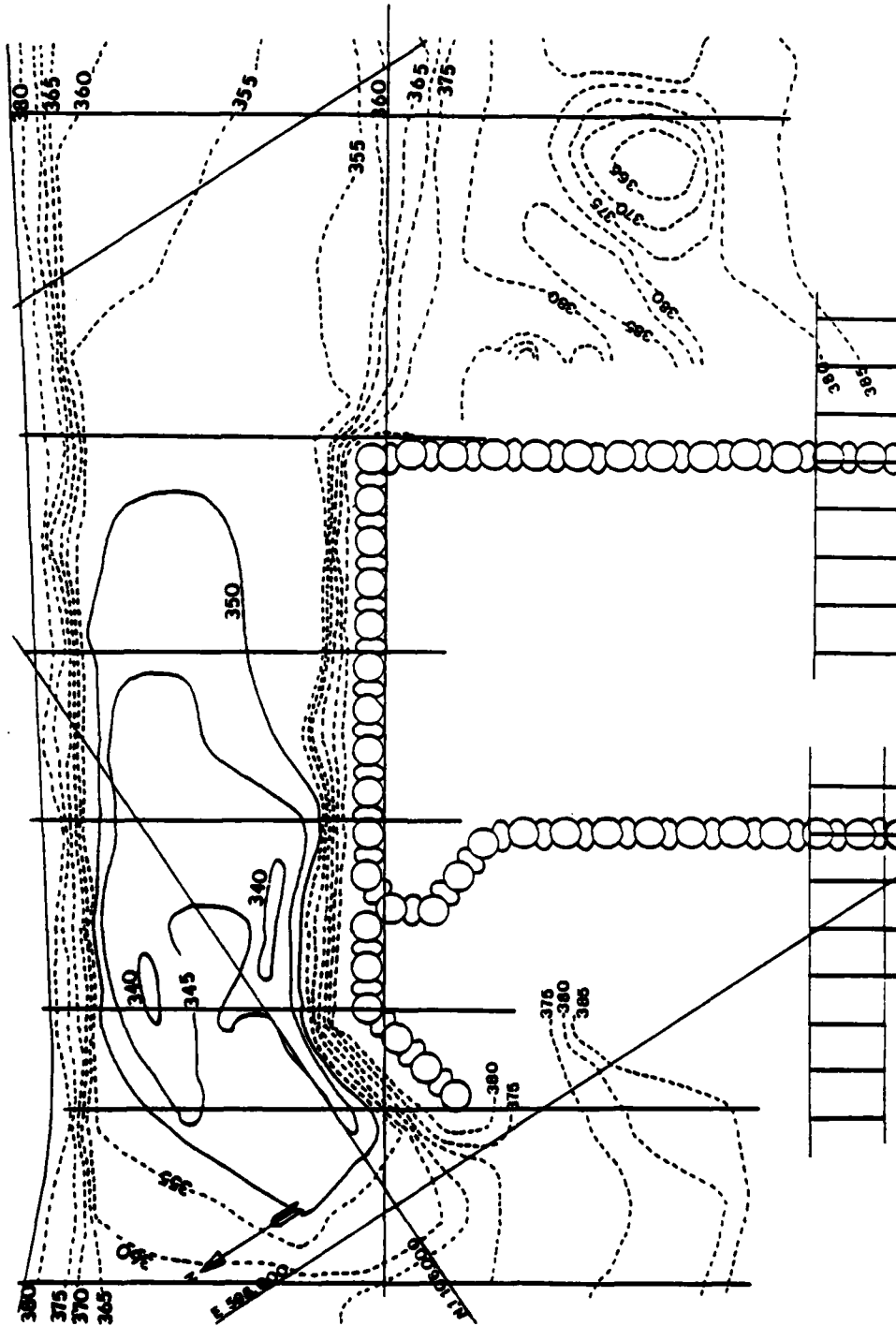


Figure 2.7(b). Scour survey map (April 1982).

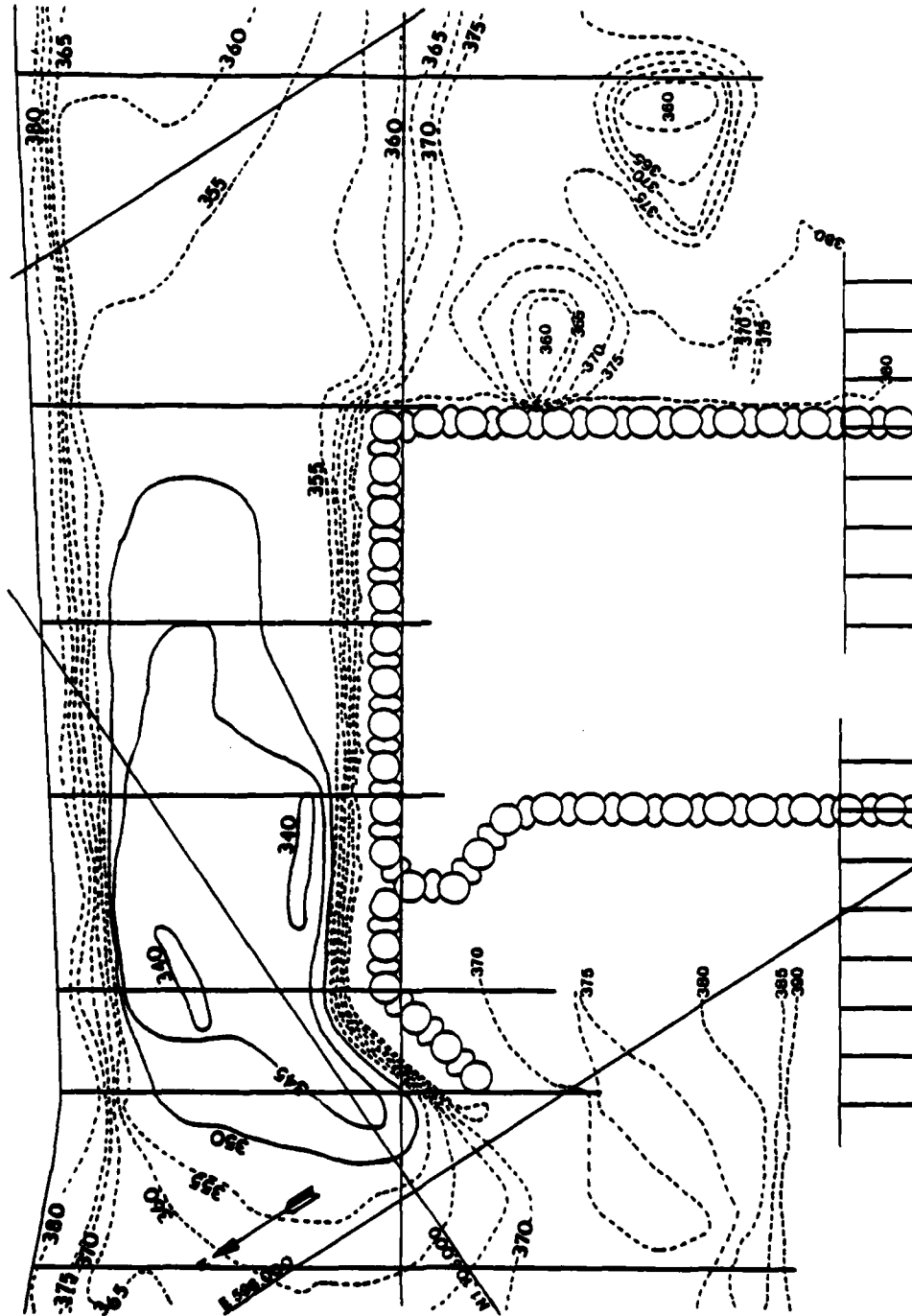


Figure 2.7(c). Scour survey map (August 1982).

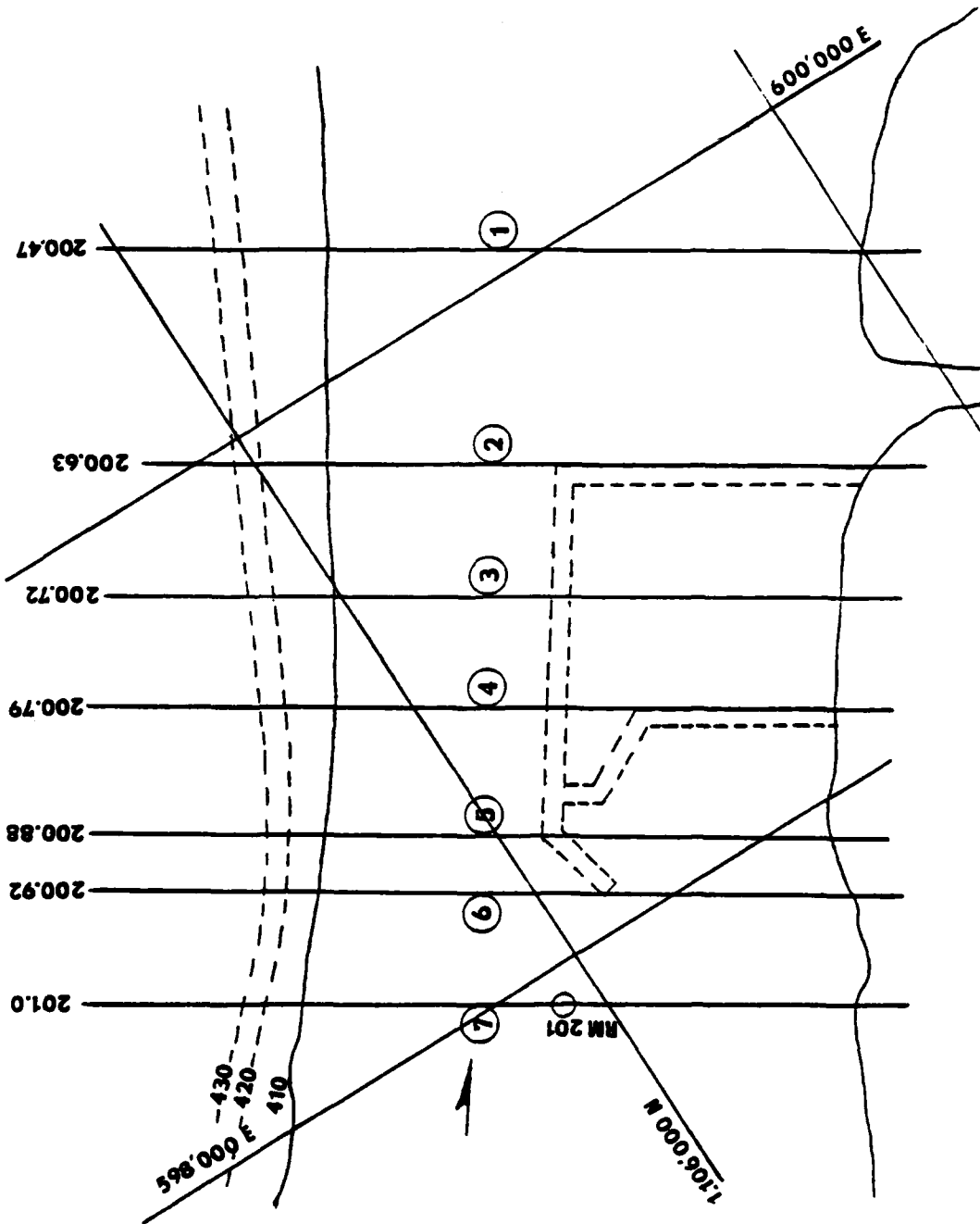


Figure 2.8. Cross sections at Lock and Dam No. 26 (Replacement).

Table 2.7. Cross-section data for Mississippi River between River Miles 200.47 and 201.0

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RN 204 Jan 1982					
INDEX -----	HOR. DIST -----	ELEVATION -----	INDEX -----	HOR. DIST -----	ELEVATION -----
(1)	0.	430.00	(7)	465.00	365.00
(2)	76.000	420.00	(8)	512.00	365.00
(3)	182.00	410.00	(9)	638.00	370.00
(4)	391.00	390.00	(10)	775.00	373.00
(5)	411.00	375.00	(11)	942.00	375.00
(6)	430.00	370.00	(12)	1064.0	374.00
			(13)		1216.0
			(14)		1246.0
			(15)		1303.0
			(16)		1341.0
			(17)		1323.0
			(18)		1975.0
			(19)		2128.0
			(20)		2310.0
					377.00
					375.00
					381.00
					384.00
					385.00
					391.00
					410.00
					414.00

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RN 201 ADR 1982			
INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	
(2)	76.000	420.00	
(3)	182.00	410.00	
(4)	252.00	380.00	
(5)	328.00	375.00	
(6)	348.00	370.00	
(7)	371.00	365.00	
(8)	673.00	360.00	
(9)	901.00	350.00	
(10)	1124.0	350.00	
(11)			1214.0
(12)			1611.0
(13)			1654.0
(14)			1724.0
(15)			1760.0

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RN					
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	439.00	(5)	332.00	375.00
(2)	76.000	429.00	(6)	359.00	370.00
(3)	182.00	410.00	(7)	471.00	365.00
(4)	277.00	388.00	(8)	871.00	365.00

Table 2.7. Continued.

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM				200.92 Jan 1982	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0	430.00	(8)	550.00	360.00
(2)	68.000	420.00	(9)	730.00	355.00
(3)	160.00	410.00	(10)	801.00	350.00
(4)	284.00	380.00	(11)	852.00	345.00
(5)	311.00	375.00	(12)	880.00	345.00
(6)	323.00	370.00	(13)	919.00	350.00
(7)	335.00	365.00	(14)	965.00	355.00
			(15)		982.00
			(16)		997.00
			(17)		1017.0
			(18)		1040.0
			(19)		1072.0
			(20)		1119.0
			(21)		1168.0
			(22)		1195.0
					360.00
					365.00
					370.00
					375.00
					380.00
					375.00
					370.00

[illegible][illegible]

Table 2.7. Continued.

[illegible][illegible]

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 200.88				Aug 1982	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00	(15)	750.00	350.00
(2)	68.00	428.00	(16)	768.00	355.00
(3)	175.00	410.00	(17)	774.00	360.00
(4)	248.00	380.00	(18)	786.00	365.00
(5)	272.00	375.00	(19)	797.00	370.00
(6)	288.00	370.00	(20)	805.00	375.00
(7)	307.00	365.00	(21)	813.00	380.00
			(22)	826.00	390.00

Table 2.7. Continued.

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 200.79 Jan 1981			CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 200.79 Apr 1982		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0	430.00	(11)	820.00	350.00
(2)	76.000	420.00	(12)	840.00	355.00
(3)	228.00	410.00	(13)	852.00	360.00
(4)	248.00	380.00	(14)	858.00	365.00
(5)	259.00	375.00	(15)	864.00	370.00
			(16)	871.00	375.00
			(17)	879.00	380.00

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 200.79 Apr 1982			CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 200.79 Aug 1982		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0	420.00	(15)	801.00	350.00
(2)	76.000	420.00	(16)	817.00	355.00
(3)	228.00	410.00	(17)	833.00	360.00
(4)	271.00	380.00	(18)	836.00	365.00
(5)	287.00	375.00	(19)	840.00	370.00
(6)	307.00	370.00	(20)	844.00	375.00
(7)	318.00	365.00	(21)	852.00	380.00
			(22)	879.00	390.00

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 200.79 Aug 1982			CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 200.79 Aug 1982		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0	430.00	(13)	822.00	350.00
(2)	76.000	420.00	(14)	825.00	355.00
(3)	228.00	410.00	(15)	830.00	360.00
(4)	279.00	380.00	(16)	836.00	365.00
(5)	287.00	375.00	(17)	842.00	370.00
(6)	296.00	370.00	(18)	848.00	375.00
			(19)	860.00	380.00
			(20)	879.00	390.00

Table 2.7. Continued.

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM			200.72 Jan 1982		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0	430.00	(9)	834.00	360.00
(2)	76.000	420.00	(10)	897.00	355.00
(3)	258.00	410.00	(11)	905.00	370.00
(4)	324.00	380.00	(12)	913.00	375.00
			(13)	924.00	380.00
CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM			200.72 Apr 1982		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0	430.00	(13)	713.00	350.00
(2)	76.000	420.00	(14)	854.00	355.00
(3)	258.00	410.00	(15)	873.00	360.00
(4)	312.00	380.00	(16)	883.00	365.00
(5)	332.00	375.00	(17)	887.00	370.00
(6)	344.00	370.00	(18)	905.00	375.00
			(19)	917.00	380.00
			(20)	932.00	380.00
CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM			200.72 Aug 1982		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0	430.00	(13)	873.00	360.00
(2)	76.000	420.00	(14)	881.00	365.00
(3)	258.00	410.00	(15)	889.00	370.00
(4)	300.00	380.00	(16)	905.00	375.00
(5)	322.00	375.00	(17)	917.00	380.00
(6)	348.00	370.00	(18)	932.00	380.00

Table 2.7. Continued.

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM					200.63 Jan 1982				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(6)	450.00	370.00	(11)	917.00	360.00	
(2)	76.000	420.00	(7)	456.00	365.00	(12)	928.00	365.00	
(3)	289.00	410.00	(8)	597.00	360.00	(13)	940.00	370.00	
(4)	377.00	380.00	(9)	738.00	360.00	(14)	950.00	375.00	
(5)	446.00	375.00	(10)	846.00	360.00	(15)	970.00	380.00	
						(16)	985.00	383.00	
CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM					200.63 Apr 1982				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(6)	373.00	370.00	(11)	925.00	360.00	
(2)	76.000	420.00	(7)	379.00	365.00	(12)	942.00	365.00	
(3)	289.00	410.00	(8)	389.00	360.00	(13)	958.00	370.00	
(4)	346.00	380.00	(9)	405.00	355.00	(14)	970.00	375.00	
(5)	366.00	375.00	(10)	891.00	355.00	(15)	981.00	380.00	
						(16)	985.00	381.00	
CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM					200.63 Aug 1982				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(6)	305.00	370.00	(11)	938.00	360.00	
(2)	76.000	420.00	(7)	397.00	365.00	(12)	948.00	365.00	
(3)	289.00	410.00	(8)	413.00	360.00	(13)	954.00	370.00	
(4)	342.00	380.00	(9)	421.00	355.00	(14)	977.00	375.00	
(5)	377.00	375.00	(10)	899.00	355.00	(15)	985.00	380.00	
						(16)	987.00	381.00	

Table 2.7. Continued.

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 200.47					Jan 1982				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0	430.00	(7)	480.00	365.00	(13)	1227.0	369.00	
(2)	83.000	420.00	(8)	523.00	360.00	(14)	1370.0	369.00	
(3)	341.00	410.00	(9)	640.00	365.00	(15)	1540.0	372.00	
(4)	417.00	380.00	(10)	870.00	375.00	(16)	1683.0	380.00	
(5)	445.00	375.00	(11)	1045.0	360.00	(17)	1804.0	380.00	
(6)	456.00	370.00	(12)	1105.0	372.00	(18)	1895.0	391.00	
						(19)	2032.0	410.00	
						(20)	2290.0	416.00	

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 200.47					Apr 1982				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0	430.00	(8)	750.00	360.00	(15)	1530.0	375.00	
(2)	83.000	420.00	(9)	915.00	355.00	(16)	1574.0	370.00	
(3)	341.00	410.00	(10)	1053.0	355.00	(17)	1600.0	365.00	
(4)	394.00	380.00	(11)	1121.0	360.00	(18)	1730.0	365.00	
(5)	409.00	375.00	(12)	1170.0	365.00	(19)	1770.0	370.00	
(6)	421.00	370.00	(13)	1200.0	370.00	(20)	1790.0	375.00	
(7)	437.00	365.00	(14)	1233.0	375.00	(21)	1821.0	380.00	

CROSS-SECTION DATA FOR MISSISSIPPI RIVER RM 200.47					Aug 1982				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0	430.00	(8)	492.00	360.00	(15)	1327.0	380.00	
(2)	83.000	420.00	(9)	813.00	355.00	(16)	1484.0	380.00	
(3)	341.00	410.00	(10)	1076.0	360.00	(17)	1531.0	375.00	
(4)	378.00	380.00	(11)	1111.0	360.00	(18)	1621.0	370.00	
(5)	403.00	375.00	(12)	1174.0	365.00	(19)	1680.0	370.00	
(6)	425.00	370.00	(13)	1213.0	370.00	(20)	1755.0	375.00	
(7)	437.00	365.00	(14)	1241.0	375.00	(21)	1809.0	380.00	
						(22)	1943.0	385.00	

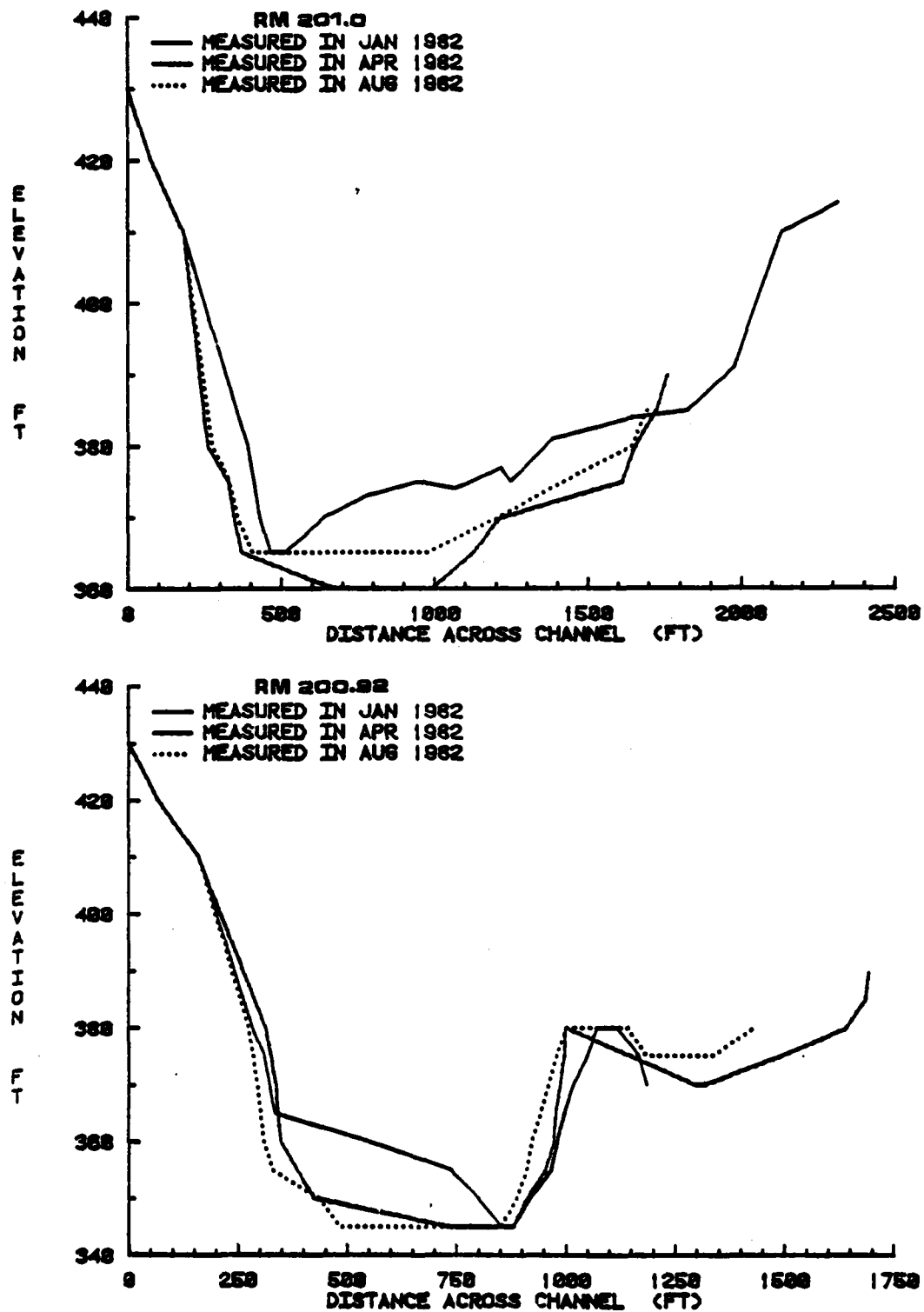


Figure 2.9. Cross section plots for Mississippi River between River Miles 200.47 and 201.

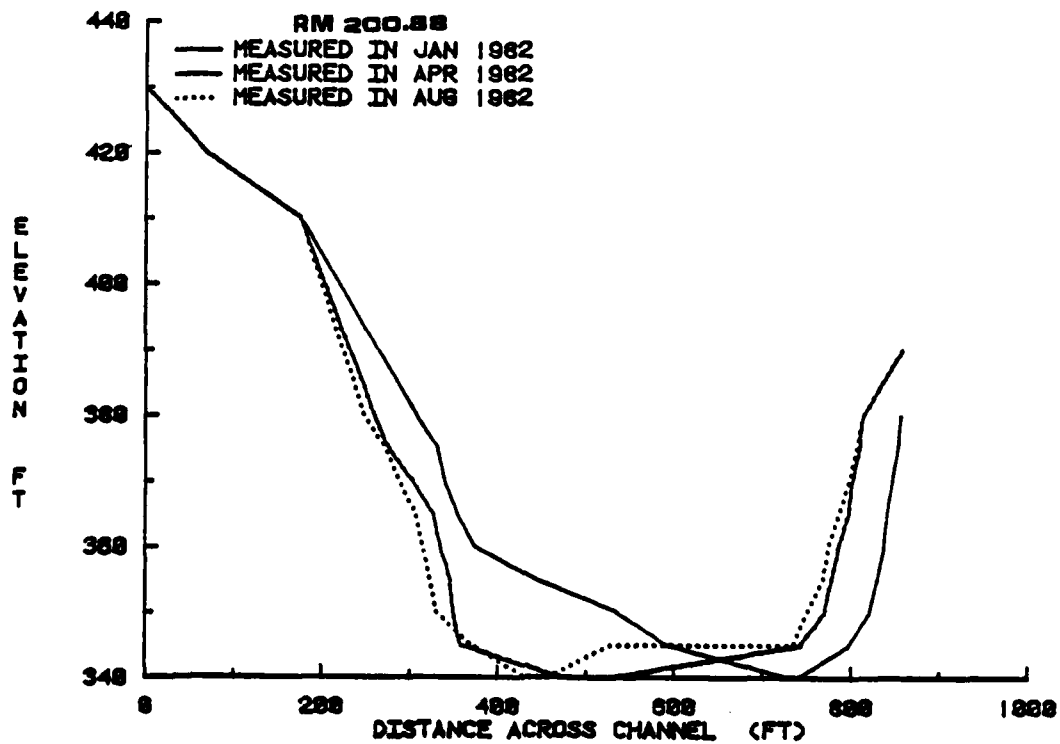
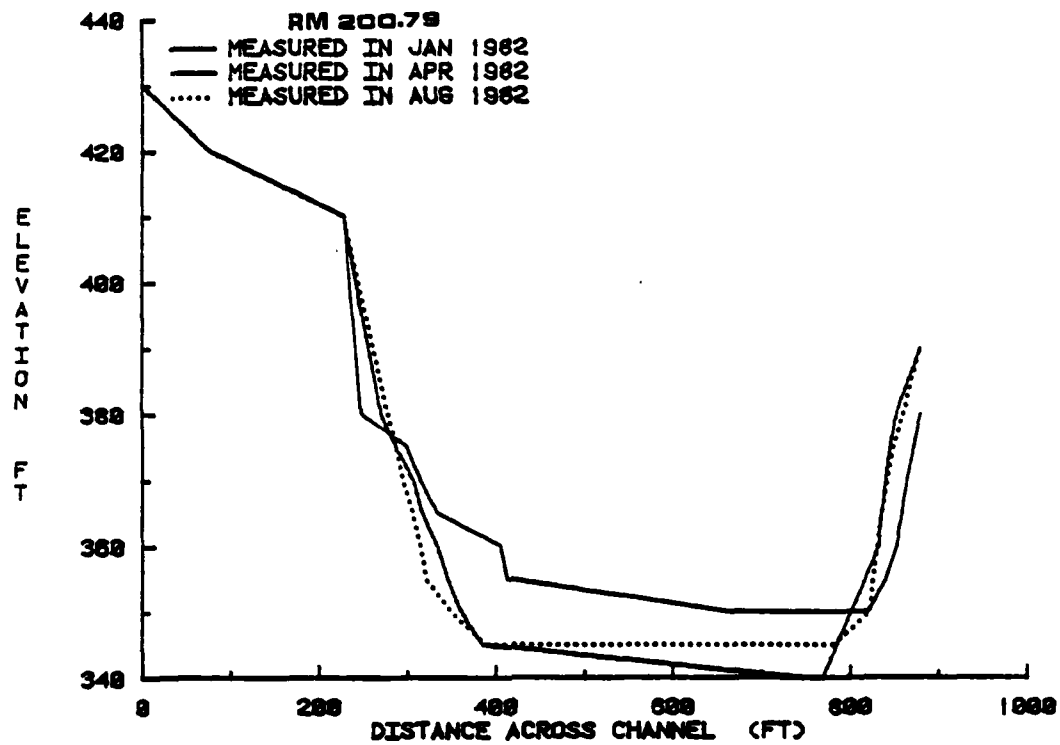


Figure 2.9. Continued.

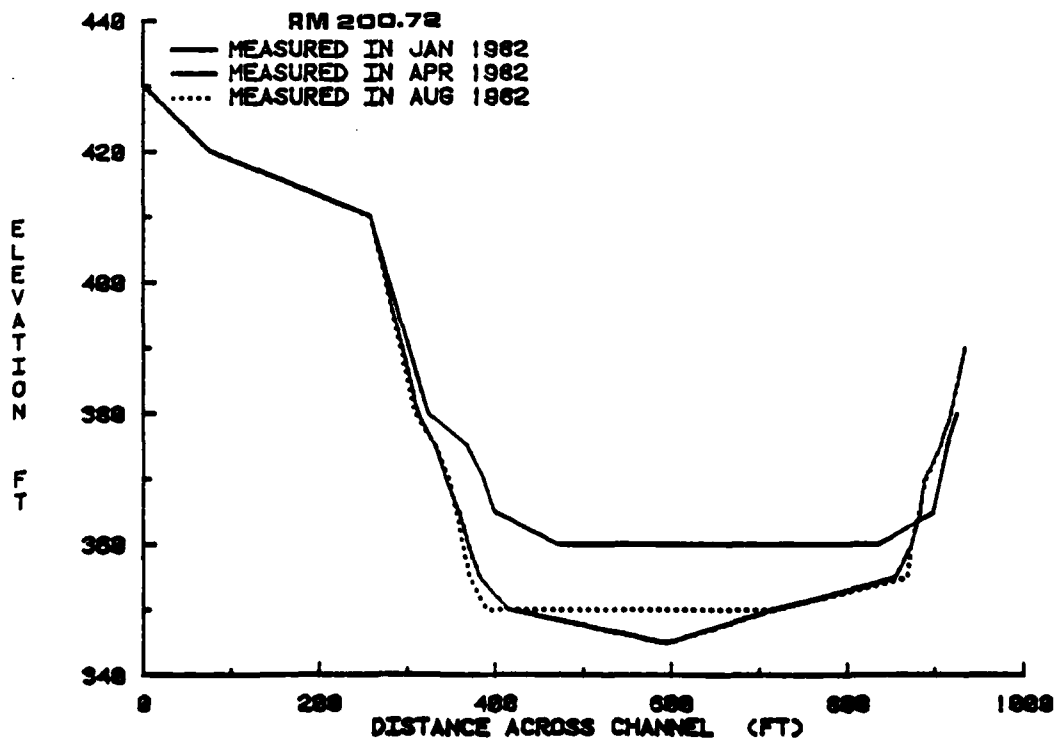
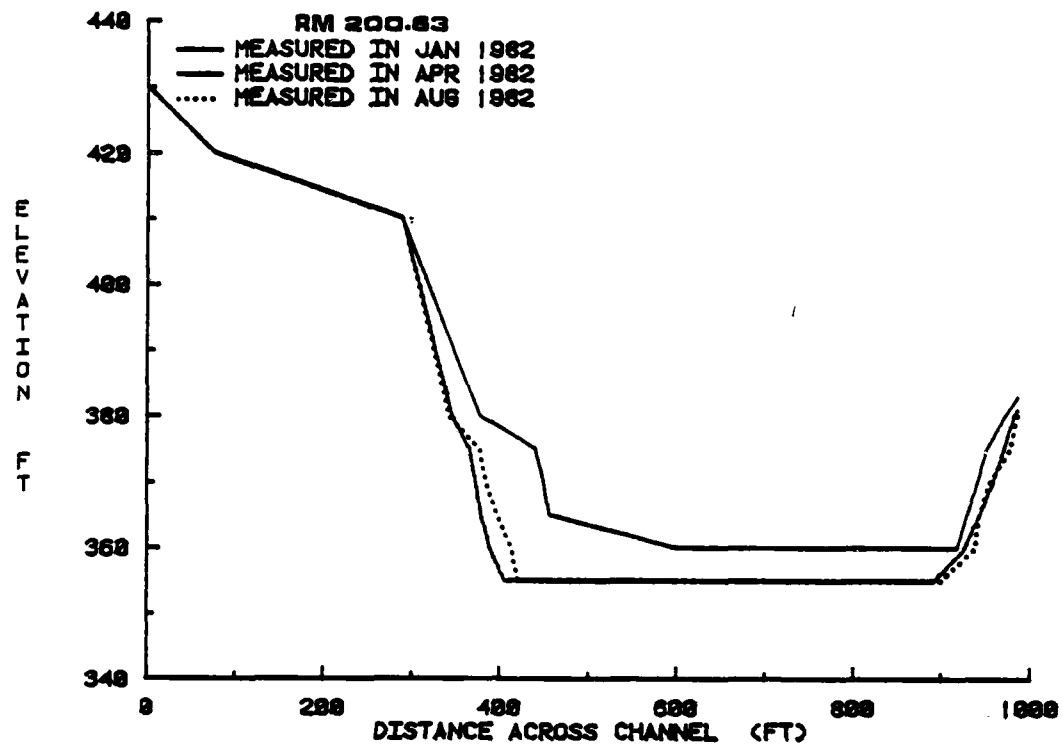


Figure 2.9. Continued.

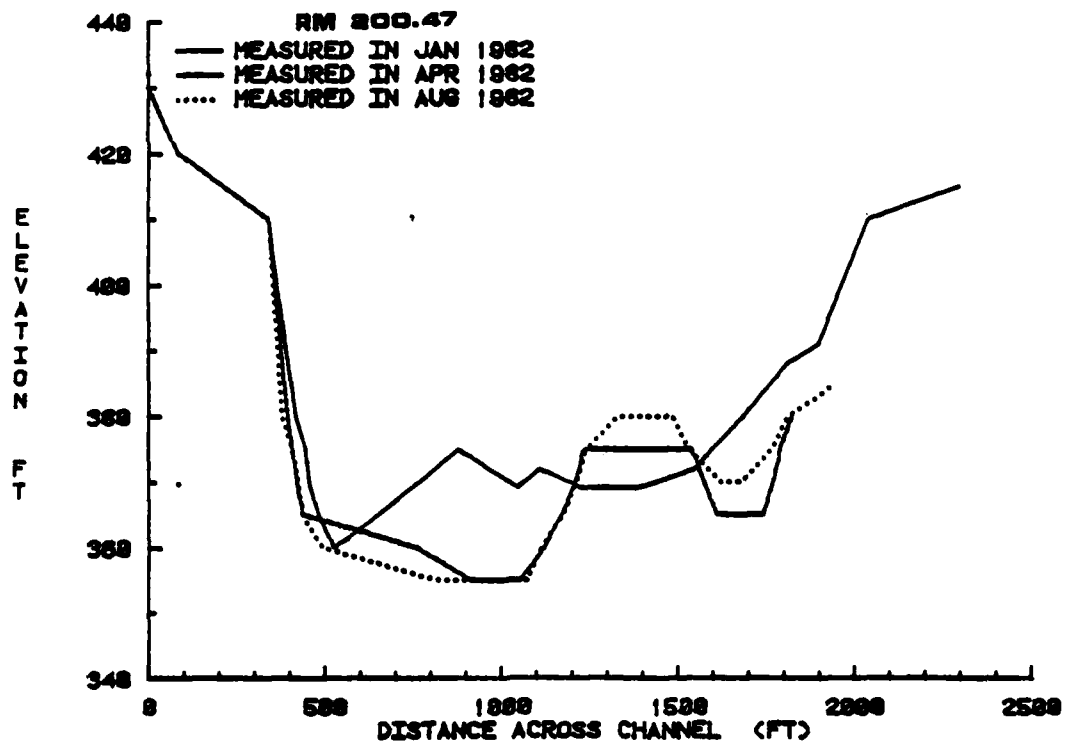


Figure 2.9. Continued.

sections will be compared with the measured cross sections presented in Figure 2.9.

2.3 Sediment Data

Sediment data for the Lock and Dam No. 26 Replacement site was provided by the Corps of Engineers, St. Louis District. The data was derived from 2-inch diameter or smaller disturbed samples secured during past subsurface explorations. For the mathematical model study, the sediment in the reach of interest has been divided into three groups: alluvium, outwash and Ice Contact deposits. Figures 2.10a through 2.10c present the gradation curves provided by Mr. Bruce H. Moore of the Corps of Engineers, St. Louis District, Foundation and Materials Branch. According to Mr. Moore, the following average elevations for the above-mentioned three layers are suggested:

Alluvium - river bottom to elev. 344 ft

Outwash - Elev. 344 ft to 324 ft

Ice Contact - Elev. 324 ft to 293 ft

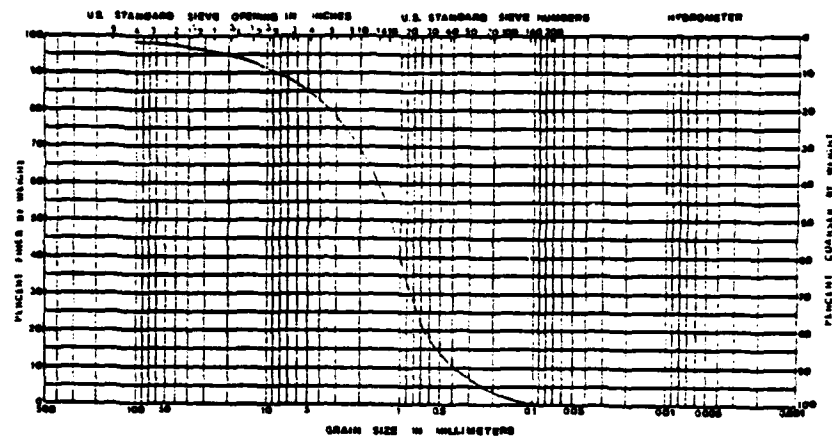


Figure 2.10(a). Gradation curve for alluvium layer.

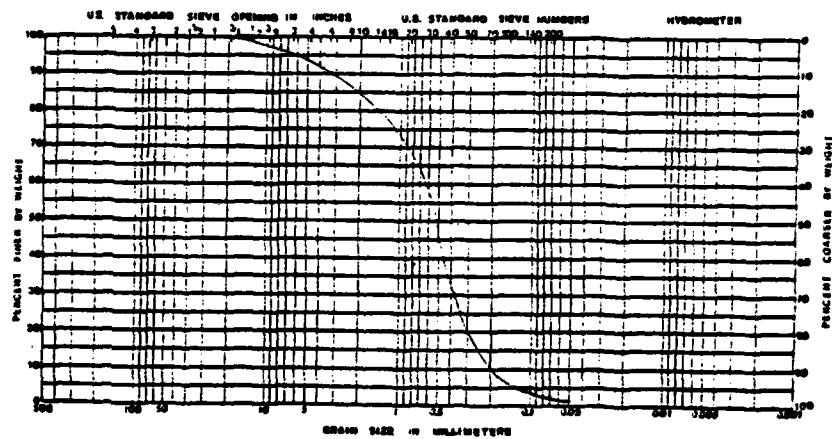


Figure 2.10(b). Gradation curve for outwash layer.

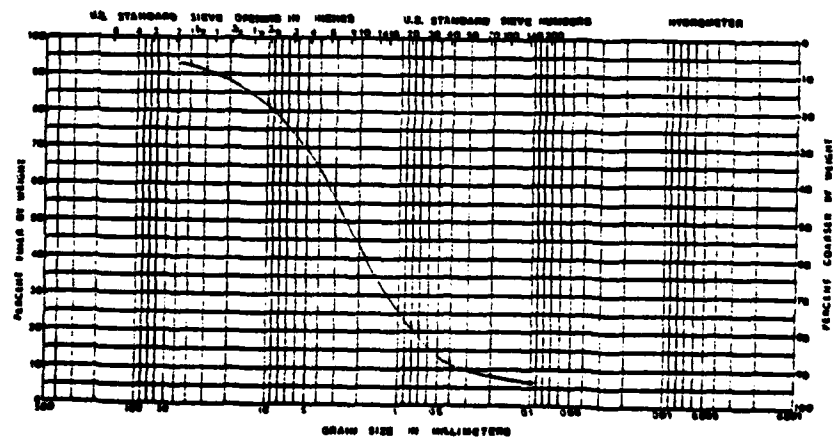


Figure 2.10(c). Gradation curve for ice contact layer.

III. Application of Streamtube Computer Model to Stage I Cofferdam

In this chapter the hydraulic and sediment computations using the data set developed previously in Chapter 2 will be presented. First, the results of water surface profile computations will be discussed. Second, the sediment routing computations which were carried out simultaneously with hydraulic computations will be presented. This phase of the study, identified as Second Phase, aimed to calibrate and verify the Streamtube Computer Model using existing flow and scour data. After screening the available data the period of January-April 1982 was selected. During this period 10 to 15 feet of scour was observed at some cross sections along the Stage I Cofferdam site. It is because of such scouring that this particular period provided a valuable model verification test.

Channel cross sections and contour maps of the Stage I cofferdam site show little change in the river bed topography following April 1982, even for flows of close or equal magnitude. This is believed to be due to the coarsening of the sediment forming the bed layer. To determine the dominant sediment size for this erosion retarding layer, various numerical experiments were conducted. The findings from this phase of the study were used extensively in the subsequent Stage II Cofferdam scouring study.

3.1 Water Surface Profile Computations

For hydraulic computations, the Streamtube Computer Model uses steady, gradually varied flow equations. During a time step the flow is regarded to remain steady and Bernouilli's equation with energy losses is applied along streamtubes.

Starting with January 22, 1982 channel cross sections presented in Tables 2.6 and 2.7, the water and sediment routing program was used to compute daily water surface profiles. Daily discharges measured at Alton, Illinois and the corresponding water surface elevations at Hartford, Illinois, presented in Tables 2.1 and 2.2, were used as the downstream boundary conditions. Due to practical limitations some simplifying assumptions were made. the river channel was assumed to have a uniform roughness across and along the study reach. Based on initial water routing runs a Manning's roughness coefficient "n" of 0.025 was selected to represent the channel roughness. The expansion and contraction loss coefficients were set to 0.3 and 0.1, respectively.

A summary of measured and computed water surface elevations along the study reach is given in Tables 3.1 and 3.2 with 4 day intervals. The data presented in Table 3.1 was extracted from the daily stage and discharge records provided by the Corps of Engineers, St. Louis District. Computed water surface elevations throughout the study reach are given in Table 3.3 and are plotted in Fig. 3.1a through Fig. 3.1r. Also given in Table 3.3 is the computed water surface elevations at the downstream and upstream of the Stage I cofferdam. A plot of computed drop in water surface elevations along the cofferdam site against measured drop is given in Fig. 3.2 for comparison purposes. This figure indicates a close agreement in predicting the water surface elevation drop along the cofferdam. The difference between measured and computed elevations is within 0.15 ft. The measured drop along the cofferdam had not taken the difference in velocity heads at the upstream and downstream ends of the cofferdam into account.

TABLE 3.1 Measured Water Surface Elevations for January-April 1982 to be used for comparison in the water surface profile computations.

DAY NO.	DISCHARGE (CFS)	STAGE AT HARTFORD (FT) NGVD.	STAGE AT PHASE I COFFERDAM		STAGE AT LOCK & DAM 26 (FT) NGVD.
			DOWNSTREAM (FT) NGVD.	UPSTREAM (FT) NGVD.	
4	51,800	399.06	--	--	399.53
8	51,100	398.95	--	--	399.38
12	124,000	407.97	--	--	408.75
16	75,100	403.82	--	--	404.29
20	65,100	401.17	--	--	401.65
24	63,600	400.45	--	--	400.98
28	118,000	405.07	--	--	406.03
32	243,000	412.57	413.7	414.4	414.17
36	241,000	414.30	415.3	416.0	416.22
40	208,000	410.10	411.0	411.9	412.02
44	172,000	408.06	--	--	409.83
48	129,000	405.40	406.1	406.7	406.86
52	205,000	407.41	--	--	409.82
56	307,000	413.93	415.9	416.9	417.31
60	351,000	415.42	417.5	418.8	419.28
64	355,000	417.69	418.3	420.1	420.63
68	290,000	412.60	414.0	415.0	415.70
72	273,000	412.30	413.7	414.6	415.19
80	255,000	411.3	--	--	413.95
84	253,000	410.2	411.6	412.6	413.3
88	340,000	415.3	417.0	418.1	418.72
92	310,000	413.70	--	--	416.87
96	282,000	411.90	412.9	415.5	415.09

TABLE 3.2 Computed Water Surface Elevations for January 22-April 1, 1982

DAY NO.	DISCHARGE (CFS)	STAGE AT HARTFORD (FT) NGVD.	STAGE AT PHASE I COFFERDAM			STAGE AT LOCK & DAM 26 (FT) NGVD.
			DOWNSTREAM (FT) NGVD.	UPSTREAM (FT) NGVD.	DIFFERENCE (FT)	
4	51,200	399.06	399.26	399.35	0.09	399.67
8	51,100	398.85	399.15	399.24	0.09	399.55
12	124,000	407.97	408.31	408.63	0.32	409.05
16	75,100	403.82	404.04	404.17	0.13	404.48
20	65,100	404.17	401.39	401.52	0.13	401.84
24	63,600	400.95	400.68	400.80	0.22	401.15
28	118,000	405.07	405.48	405.81	0.33	406.32
32	243,000	412.57	413.30	414.15	0.85	414.90
36	241,000	414.30	414.92	415.70	0.78	416.33
40	208,000	410.10	410.79	411.46	0.67	412.17
44	172,000	408.06	408.65	409.13	0.48	409.75
48	129,000	405.40	405.87	406.18	0.31	406.69
52	205,000	407.41	408.03	408.65	0.62	409.38
56	307,000	413.93	414.47	415.51	1.04	416.30
60	351,000	415.42	415.99	417.23	1.24	418.11
64	355,000	417.69	418.11	419.24	1.13	419.99
68	290,000	412.60	413.23	414.11	0.88	414.88
72	273,000	412.30	412.90	413.66	0.76	414.37

Table 3.3. Water surface profile for Mississippi River RM 196.8 - 202.7.

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A.					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7 DAY 4					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	399.47	(7)	24816.	399.40
(2)	30096.	399.62	(8)	23760.	399.38
(3)	29040.	399.59	(9)	22176.	399.35
(4)	27984.	399.56	(10)	21754.	399.35
(5)	26928.	399.53	(11)	21542.	399.34
(6)	25872.	399.45	(12)	21067.	399.33
			(13)	20698.	399.29
			(14)	20222.	399.28
			(15)	19378.	399.26
			(16)	18480.	399.21
			(17)	13200.	399.17
			(18)	0.	399.06

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A.					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7 DAY 8					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	399.55	(7)	24816.	399.29
(2)	30096.	399.51	(8)	23760.	399.27
(3)	29040.	399.48	(9)	22176.	399.24
(4)	27984.	399.44	(10)	21754.	399.24
(5)	26928.	399.43	(11)	21542.	399.22
(6)	25872.	399.34	(12)	21067.	399.22
			(13)	20698.	399.18
			(14)	20222.	399.16
			(15)	19378.	399.15
			(16)	18480.	399.10
			(17)	13200.	399.06
			(18)	0.	398.95

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A.					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7 DAY 12					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	409.05	(7)	24816.	408.73
(2)	30096.	409.00	(8)	23760.	408.70
(3)	29040.	408.97	(9)	22176.	408.63
(4)	27984.	408.93	(10)	21754.	408.57
(5)	26928.	408.91	(11)	21542.	408.51
(6)	25872.	408.78	(12)	21067.	408.46
			(13)	20698.	408.36
			(14)	20222.	408.34
			(15)	19378.	408.31
			(16)	18480.	408.26
			(17)	13200.	408.16
			(18)	0.	407.97

Table 3.3. Continued.

MAP OUTPUT			
POINTS PLOTTED FOR GRAPH, 1A.			
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RN 194.8-202.7 DAY 16			
INDEX	DISTANCE	ELEVATION	ELEVATION
(1)	31152.	404.48	404.23
(2)	30096.	404.44	404.21
(3)	29040.	404.42	404.17
(4)	27984.	404.39	404.16
(5)	26928.	404.37	404.13
(6)	25872.	404.28	404.12
(7)	24816.		
(8)	23760.		
(9)	22704.		
(10)	21754.		
(11)	21542.		
(12)	21067.		
(13)	20498.		
(14)	20222.		
(15)	19378.		
(16)	18480.		
(17)	13200.		
(18)	0.		
			404.07
			404.05
			404.04
			403.99
			403.93
			403.82

M A P O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A,					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7 DAY 20					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	401.84	(7)	24814.	401.57
(2)	30096.	401.80	(8)	23760.	401.55
(3)	29040.	401.77	(9)	22174.	401.52
(4)	27984.	401.73	(10)	21754.	401.51
(5)	26928.	401.72	(11)	21542.	401.49
(6)	25872.	401.62	(12)	21067.	401.48
			(13)	20498.	401.43
			(14)	20222.	401.41
			(15)	19378.	401.40
			(16)	18480.	401.35
			(17)	13200.	401.30
			(18)	0.	401.17

M A P O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A,					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.B-202.7 DAY 24					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	401.15	(7)	24816.	400.87
(2)	30094.	401.10	(8)	23760.	400.84
(3)	29040.	401.07	(9)	22176.	400.81
(4)	27984.	401.03	(10)	21754.	400.80
(5)	26928.	401.02	(11)	21542.	400.78
(6)	25872.	400.92	(12)	21067.	400.77
			(13)	20490.	400.72
			(14)	20222.	400.70
			(15)	19378.	400.69
			(16)	18480.	400.64
			(17)	13200.	400.58
			(18)	0.	400.45

Table 3.3. Continued.

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A:					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7 DAY 28					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	406.32	(7)	24816.	405.91
(2)	30096.	404.25	(8)	23760.	405.88
(3)	29040.	404.20	(9)	22176.	405.81
(4)	27984.	404.15	(10)	21754.	405.77
(5)	26928.	404.13	(11)	21542.	405.70
(6)	25872.	405.96	(12)	21067.	405.65
			(13)	20698.	405.56
			(14)	20222.	405.52
			(15)	19378.	405.48
			(16)	18480.	405.43
			(17)	13200.	405.32
			(18)	0.	405.07

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A:					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7 DAY 32					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	414.90	(7)	24816.	414.37
(2)	30096.	414.85	(8)	23760.	414.33
(3)	29040.	414.77	(9)	22176.	414.15
(4)	27984.	414.70	(10)	21754.	413.93
(5)	26928.	414.67	(11)	21542.	413.71
(6)	25872.	414.42	(12)	21067.	413.66
			(13)	20698.	413.44
			(14)	20222.	413.35
			(15)	19378.	413.30
			(16)	18480.	413.25
			(17)	13200.	413.01
			(18)	0.	412.57

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A:					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7 DAY 36					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	414.33	(7)	24816.	415.90
(2)	30096.	416.30	(8)	23760.	415.87
(3)	29040.	416.23	(9)	22176.	415.70
(4)	27984.	416.17	(10)	21754.	415.49
(5)	26928.	416.14	(11)	21542.	415.25
(6)	25872.	415.95	(12)	21067.	415.20
			(13)	20698.	415.02
			(14)	20222.	414.95
			(15)	19378.	414.92
			(16)	18480.	414.87
			(17)	13200.	414.66
			(18)	0.	414.30

Table 3.3. Continued.

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A, SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7					
INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	412.17	(7)	24816.	411.67
(2)	30096.	412.11	(8)	23760.	411.63
(3)	29040.	412.03	(9)	22176.	411.46
(4)	27984.	411.94	(10)	21754.	411.31
(5)	26928.	411.92	(11)	21542.	411.11
(6)	25872.	411.72	(12)	21067.	411.06
			(13)	20698.	410.90
			(14)	20222.	410.83
			(15)	19378.	410.79
			(16)	18480.	410.74
			(17)	13200.	410.52
			(18)	0.	410.10

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A, SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7					
INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	409.75	(7)	24816.	409.31
(2)	30096.	409.69	(8)	23760.	409.28
(3)	29040.	409.62	(9)	22176.	409.13
(4)	27984.	409.54	(10)	21754.	409.03
(5)	26928.	409.53	(11)	21542.	408.90
(6)	25872.	409.34	(12)	21067.	408.85
			(13)	20698.	408.74
			(14)	20222.	408.68
			(15)	19378.	408.65
			(16)	18480.	408.60
			(17)	13200.	408.43
			(18)	0.	408.06

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A, SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7					
INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	406.69	(7)	24816.	406.31
(2)	30096.	406.63	(8)	23760.	406.29
(3)	29040.	406.58	(9)	22176.	406.18
(4)	27984.	406.53	(10)	21754.	406.13
(5)	26928.	406.50	(11)	21542.	406.04
(6)	25872.	406.36	(12)	21067.	406.01
			(13)	20698.	405.94
			(14)	20222.	405.90
			(15)	19378.	405.87
			(16)	18480.	405.82
			(17)	13200.	405.69
			(18)	0.	405.40

Table 3.3. Continued.

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A, WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7 DAY 52					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	409.38	(7)	24816.	408.85
(2)	30096.	409.29	(8)	23760.	408.81
(3)	29040.	409.20	(9)	22176.	408.65
(4)	27984.	409.10	(10)	21754.	408.47
(5)	26928.	409.05	(11)	21542.	408.23
(6)	25872.	408.79	(12)	21067.	408.33
			(13)	20698.	408.18
			(14)	20222.	408.09
			(15)	19378.	408.03
			(16)	18400.	408.22
			(17)	13200.	407.97
			(18)	0.	407.41

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A, WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7 DAY 54					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	416.30	(7)	24816.	415.75
(2)	30096.	416.25	(8)	23760.	415.72
(3)	29040.	416.14	(9)	22176.	415.51
(4)	27984.	416.05	(10)	21754.	415.13
(5)	26928.	415.99	(11)	21542.	414.72
(6)	25872.	415.72	(12)	21067.	414.84
			(13)	20698.	414.65
			(14)	20222.	414.53
			(15)	19378.	414.48
			(16)	18400.	414.86
			(17)	13200.	414.52
			(18)	0.	413.93

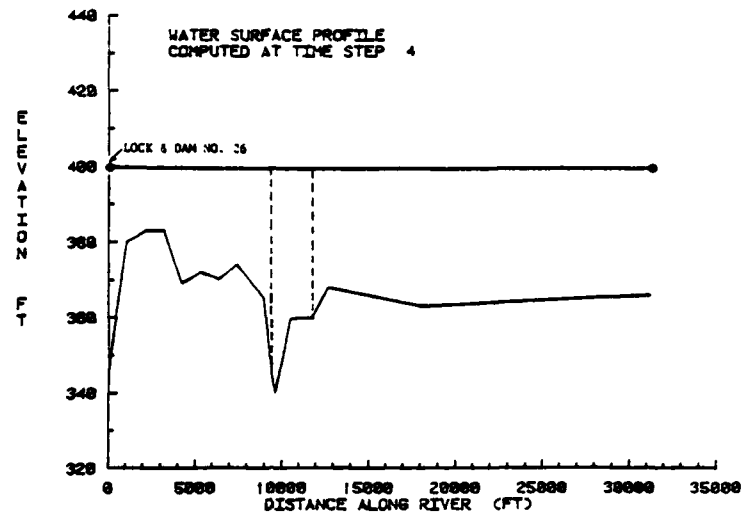
M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A, WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7 DAY 50					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	418.11	(7)	24816.	417.50
(2)	30096.	418.07	(8)	23760.	417.47
(3)	29040.	417.94	(9)	22176.	417.23
(4)	27984.	417.84	(10)	21754.	416.76
(5)	26928.	417.77	(11)	21542.	416.26
(6)	25872.	417.48	(12)	21067.	416.40
			(13)	20698.	416.19
			(14)	20222.	416.05
			(15)	19378.	415.99
			(16)	18400.	416.45
			(17)	13200.	416.08
			(18)	0.	415.42

Table 3.3. Continued.

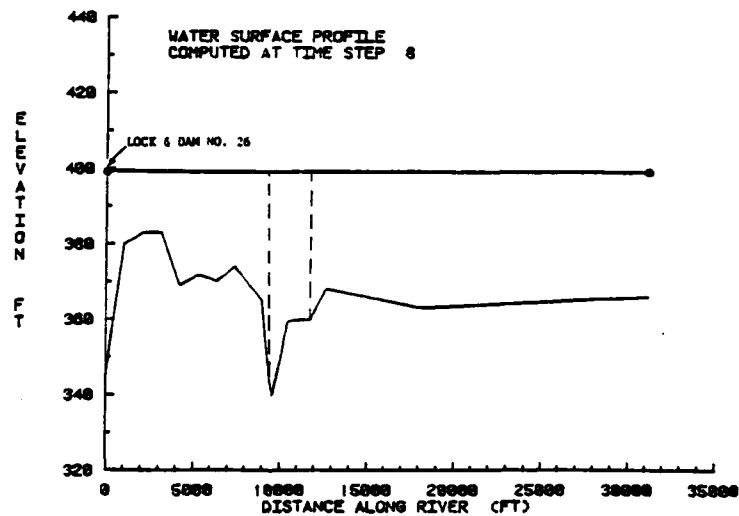
M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A,					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	419.99	(7)	24816.	419.48
(2)	30096.	419.97	(8)	23760.	419.45
(3)	29040.	419.86	(9)	22176.	419.24
(4)	27984.	419.78	(10)	21754.	418.80
(5)	26928.	419.71	(11)	21542.	418.32
(6)	25872.	419.47	(12)	21067.	418.45
(13)	20498.	418.27	(13)	20498.	418.27
(14)	20222.	418.15	(14)	20222.	418.15
(15)	19378.	418.12	(15)	19378.	418.12
(16)	18480.	418.54	(16)	18480.	418.54
(17)	13200.	418.22	(17)	13200.	418.22
(18)	0.	417.69	(18)	0.	417.69

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A,					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	414.88	(7)	24816.	414.33
(2)	30096.	414.83	(8)	23760.	414.30
(3)	29040.	414.72	(9)	22176.	414.12
(4)	27984.	414.62	(10)	21754.	413.80
(5)	26928.	414.56	(11)	21542.	413.44
(6)	25872.	414.31	(12)	21067.	413.54
(13)	20498.	413.39	(13)	20498.	413.39
(14)	20222.	413.28	(14)	20222.	413.28
(15)	19378.	413.23	(15)	19378.	413.23
(16)	18480.	413.52	(16)	18480.	413.52
(17)	13200.	413.20	(17)	13200.	413.20
(18)	0.	412.60	(18)	0.	412.60

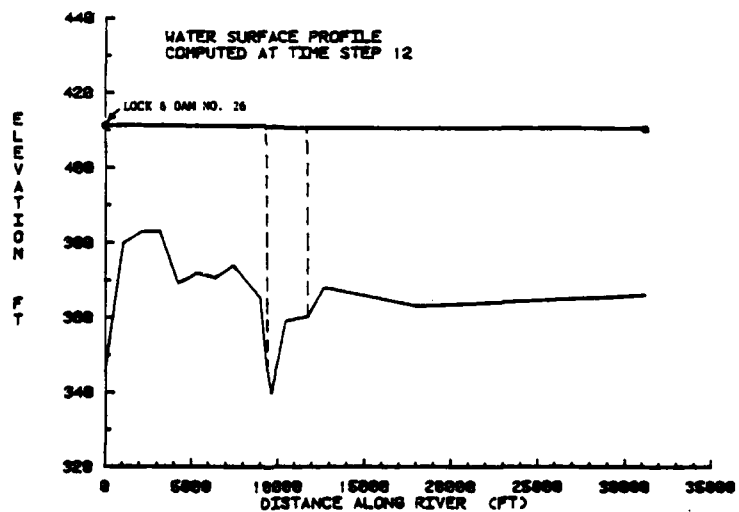
M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A,					
WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 196.8-202.7					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	31152.	414.37	(7)	24816.	413.86
(2)	30096.	414.32	(8)	23760.	413.83
(3)	29040.	414.22	(9)	22176.	413.66
(4)	27984.	414.13	(10)	21754.	413.39
(5)	26928.	414.07	(11)	21542.	413.08
(6)	25872.	413.85	(12)	21067.	413.17
(13)	20498.	413.04	(13)	20498.	413.04
(14)	20222.	412.94	(14)	20222.	412.94
(15)	19378.	412.90	(15)	19378.	412.90
(16)	18480.	413.14	(16)	18480.	413.14
(17)	13200.	412.85	(17)	13200.	412.85
(18)	0.	412.30	(18)	0.	412.30



(a)

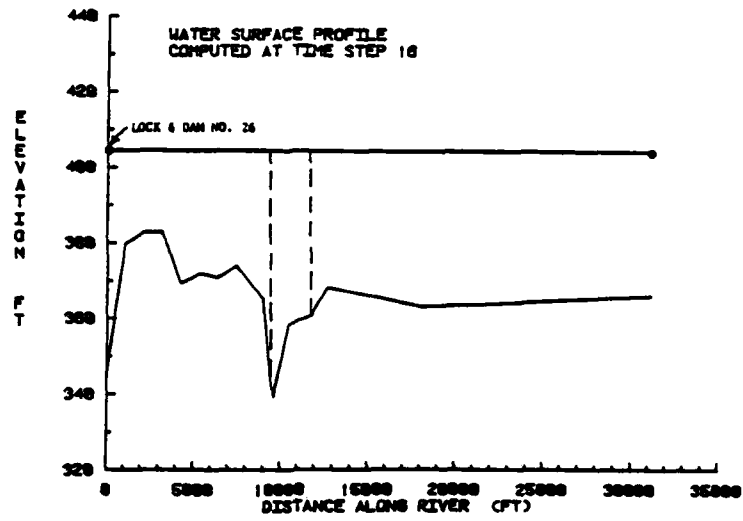


(b)

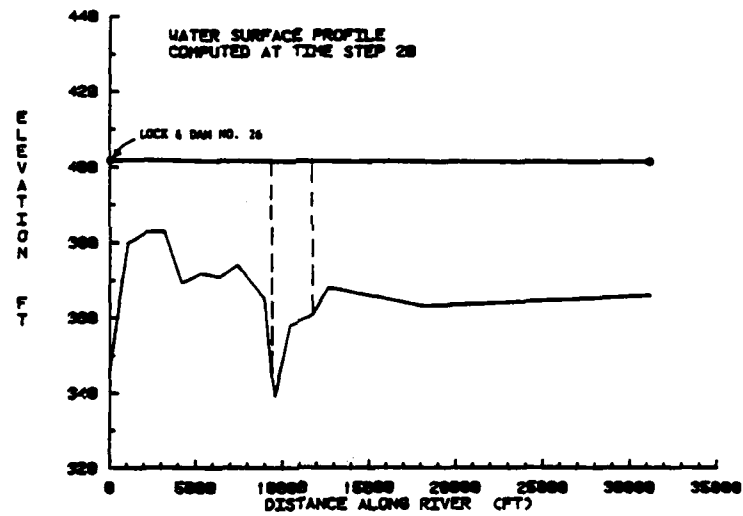


(c)

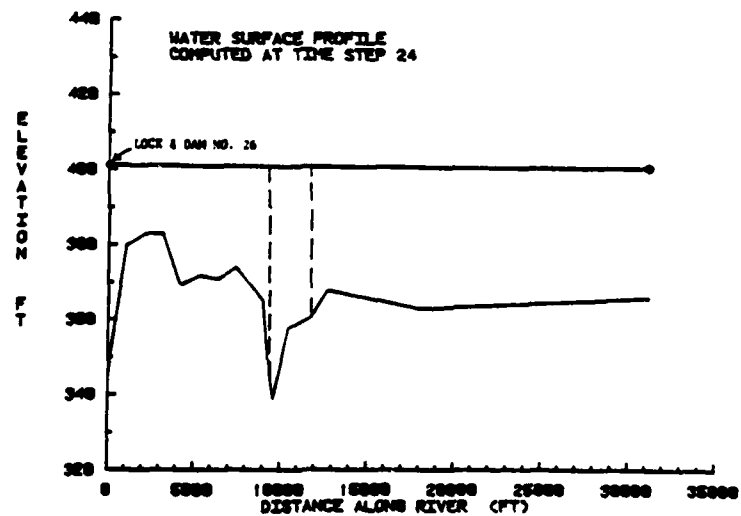
Figure 3.1. Water surface profiles, Mississippi River, RM 196.8 - 202.7.



(d)

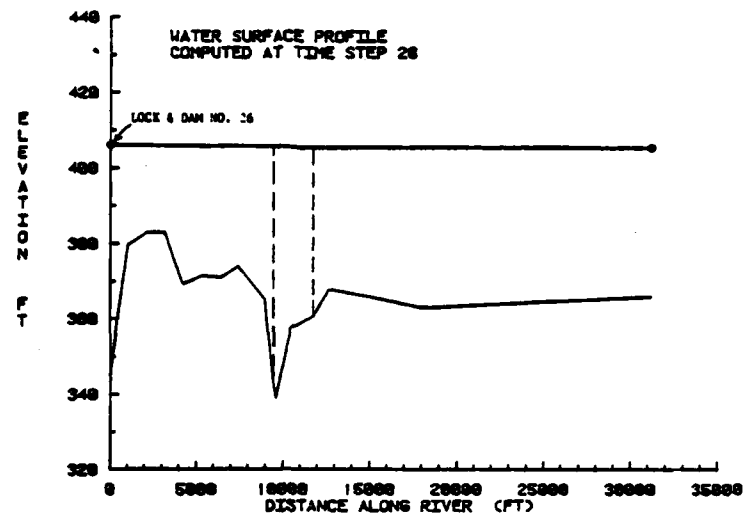


(e)

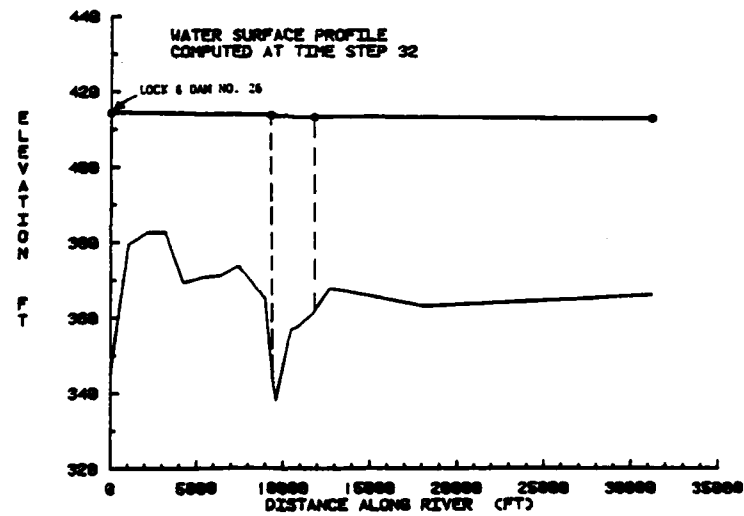


(f)

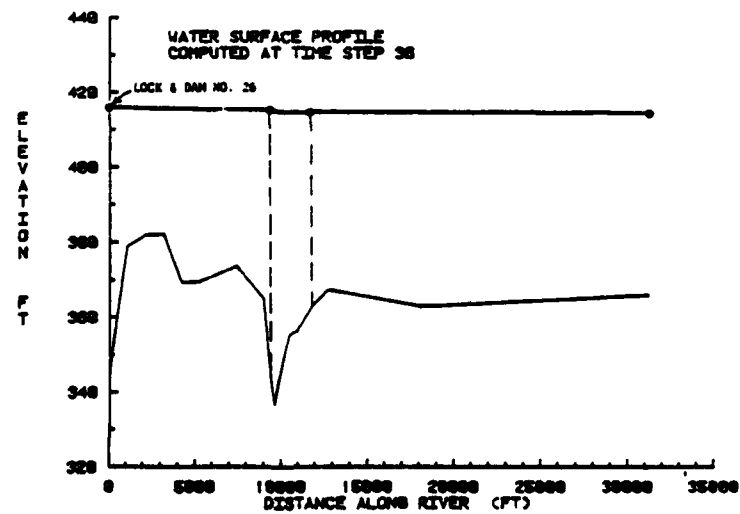
Figure 3.1. Continued.



(g)

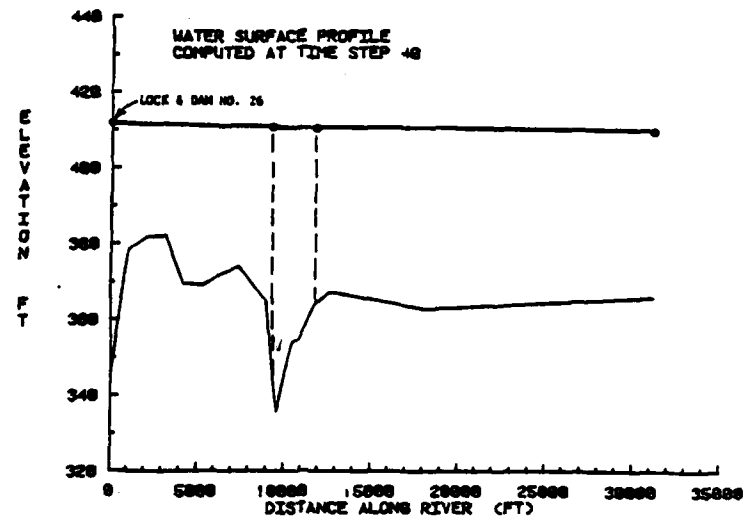


(h)

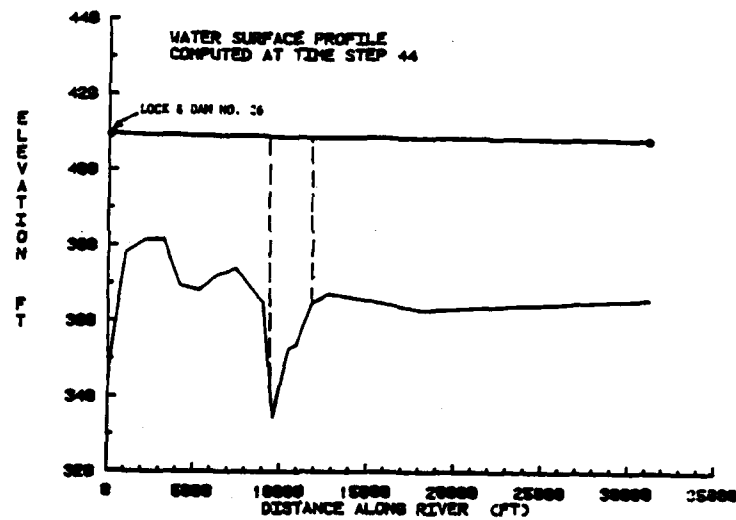


(i)

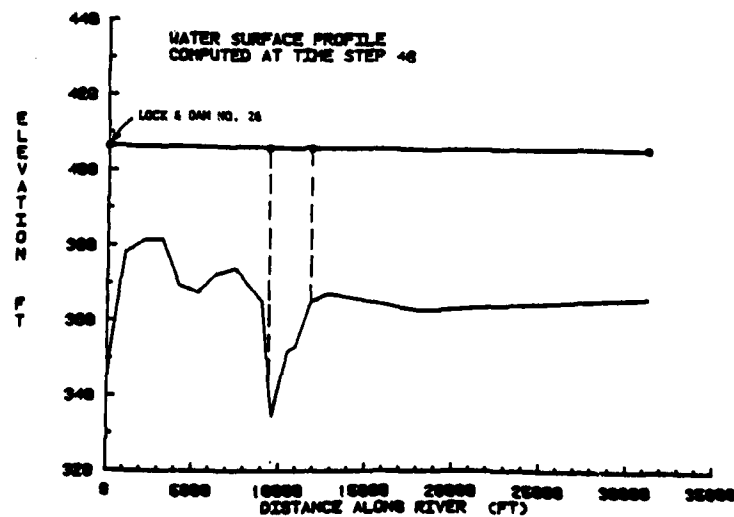
Figure 3.1. Continued.



(j)

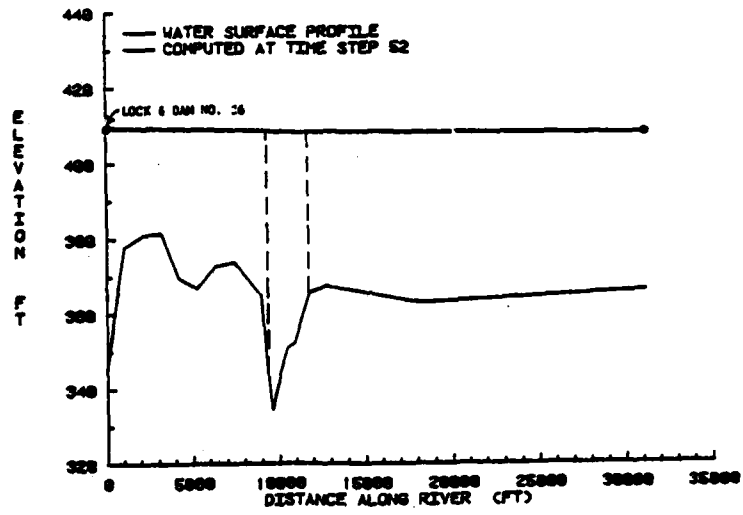


(k)

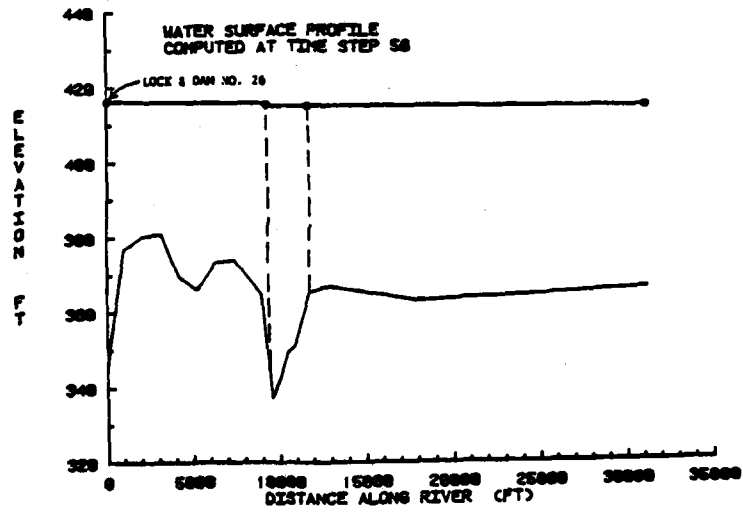


(l)

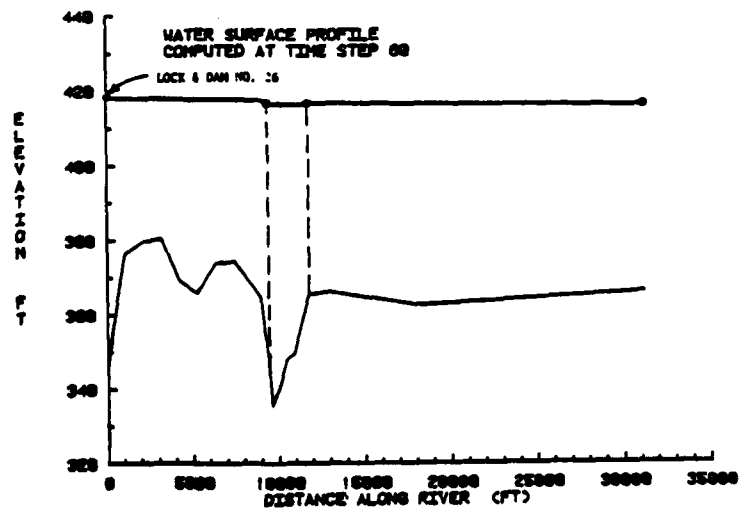
Figure 3.1. Continued.



(m)

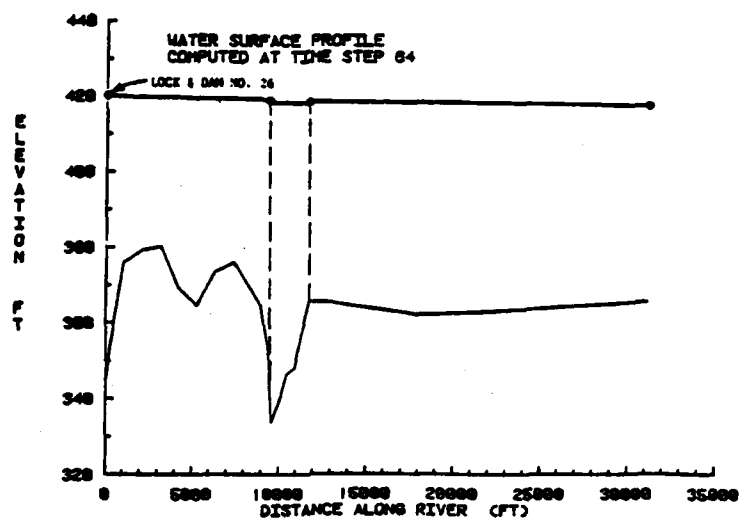


(n)

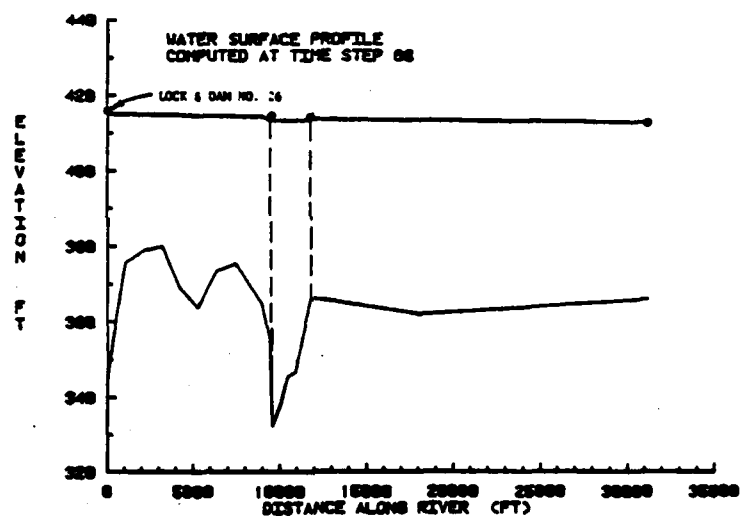


(o)

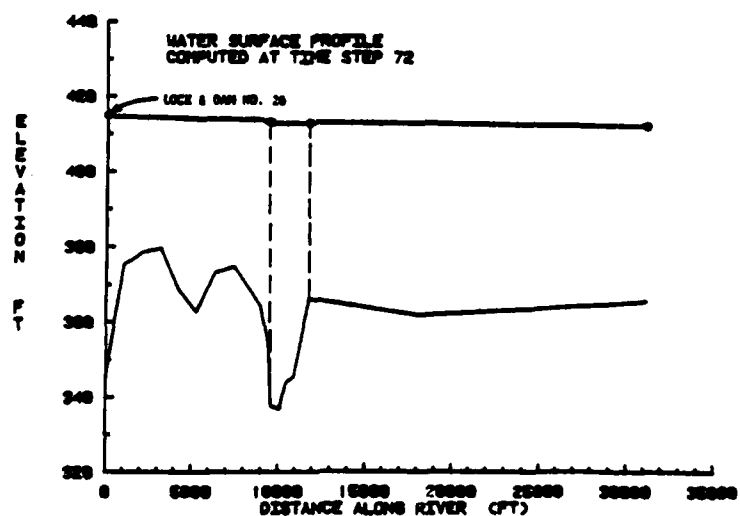
Figure 3.1. Continued.



(p)



(q)



(r)

Figure 3.1. Continued.

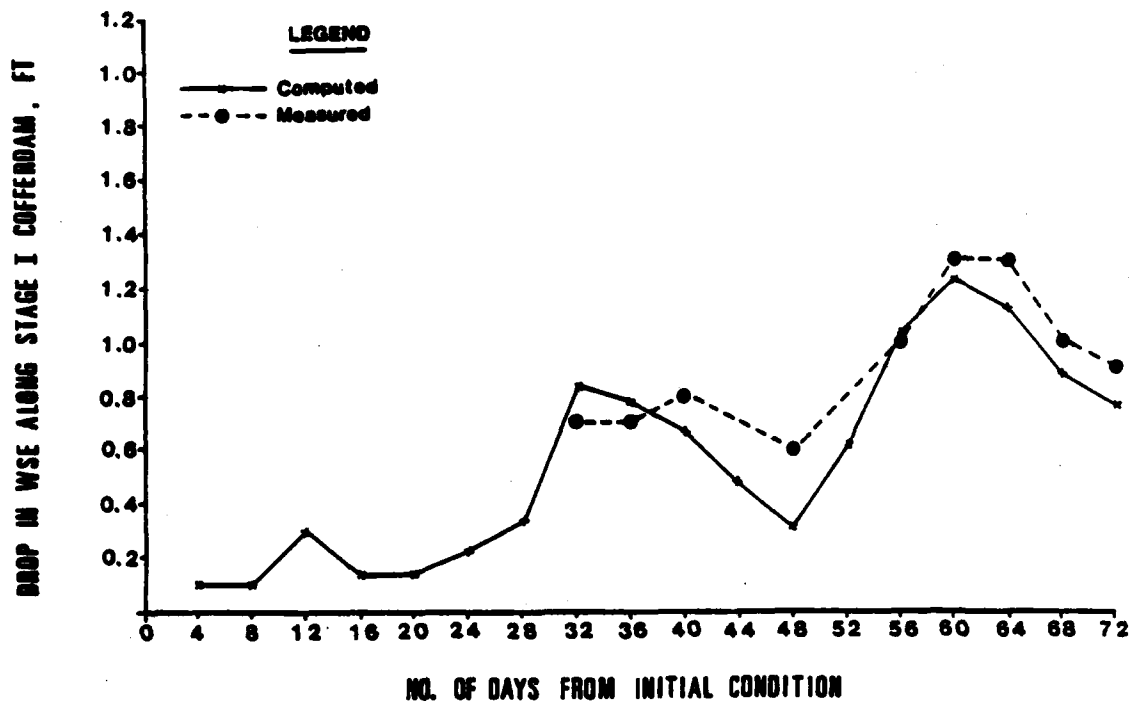


Figure 3.2. Drop in water surface elevation along Stage I cofferdam (January 22 - April 1, 1982).

Considering the fact that higher velocities were experienced at the upstream end of the Stage I cofferdam, the difference between measured and computed drop in water surface elevations were within ± 0.1 ft. However, the water surface elevations at the upstream end of the study reach showed higher differences. For flows up to 240,000 cfs the results were within 0.2 ft. For the discharge of 355,000 cfs the difference between measured and computed water surface elevations at Alton, Illinois were 0.64 ft. For this discharge the elevation of water surface was 420 ft N.G.V.D. The higher discrepancy for increasing stages is due to the assumption of a uniform roughness coefficient across the channel, and the use of May 1977 cross sections away from the Stage I cofferdam. By increasing the stages, more of overbank regions are included into the flow area. Neglecting the additional roughness introduced by the overbank regions is expected to produce lower computed water surface elevations. The use of May 1977 cross sections away from the cofferdam is believed to be another major source of discrepancy.

Other items for consideration are the time and accuracy of water surface elevation measurements at Alton, Illinois. The time at which measurements are taken is especially important during rapid changes in downstream or upstream water surface elevations. Also, under certain flow conditions the level of accuracy for water surface elevation measurements are generally expected to be lower. The present computations were extended upstream up to the River Mile 202.7. For the sake of simplicity the computations were carried out up to the downstream end of the highway bridge connecting State of Missouri to Illinois. The unaccounted drop across this highway bridge was also partially responsible for the lower computed water surface elevations at Alton, Illinois.

For this study the water surface computations had the largest impact on the sediment transport computations in estimating the energy gradient along the cofferdam structure. Since measured and computed water surface gradients were in close agreement these computations were not elaborated any further.

3.2 Sediment Routing Computations

For sediment routing computations, the Streamtube Computer Model uses Exner type sediment continuity equation along each stream tube. Change in bed elevation at a given cross section is computed by balancing the amount of sediment entering and leaving the cross section during a time step and the volume of accumulation/scouring from the cross section during this period of time. Once the hydraulic computations are performed and variables like, velocity, hydraulic radius, energy slope, cross sectional area, width are determined along a stream tube, the amount of sediment transport capacity at each cross section is computed for different sediment size fractions. Presently the computer model offers a selection of seven methods for sediment transport capacity computations. These options are:

1. Yang's 1973 and 1983 equations
2. Ackers and White equation
3. Engelund and Hansen's equation
4. Modified Einstein Method
5. Toffaletti Method
6. Einstein's Method
7. Meyer-Peter and Muller's equation

Depending on the availability of a given sediment size and the transport capacity of the stream to carry a certain size sediment the net sediment deposition/scour at a given cross section is computed.

For the present study the sediment transport capacity of stream tubes were computed by Yang's 1973 equation for sediment sizes up to 2 mm, and Yang's 1983 equation for sediments of larger sizes.

Figure 3.3 gives the comparison between measured bed material discharge of Mississippi River at St. Louis, Mo. and computed results of different equations (Yang and Stall, 1976). As demonstrated in this figure, Yang's 1973 equation could estimate the bed material discharge at the project site adequately.

The gradation curve for the alluvium layer given in Fig. 2.10a was used to describe the initial river-bed material. The size ranges and fractions used for the sediment were:

Size Ranges	Size Fractions
0.0625-0.2000 mm	10%
0.2000-0.5000 mm	37%
0.5000-1.0000 mm	26%
1.0000-3.0000 mm	16%
3.0000-10.00 mm	11%

Results of sediment routing computations are presented in Tables 3.4 through 3.9 and in Figs. 3.4 through 3.16. Tables 3.4 through 3.9 tabulate the computed channel cross sections along the Stage I Cofferdam at various stations at different time steps. Figures 3.4 through 3.10 display plots of these cross sections. The same results are displayed in Figs. 3.13, 3.15, 3.17 and 3.18 in terms of contour maps of the cofferdam region. Starting with the January 22, 1982 contour maps, measured contour maps for 2 February, 2 March, and 1 April 1982 are also given in Figs. 3.11, 3.12, 3.14, and 3.16 for comparison purposes.

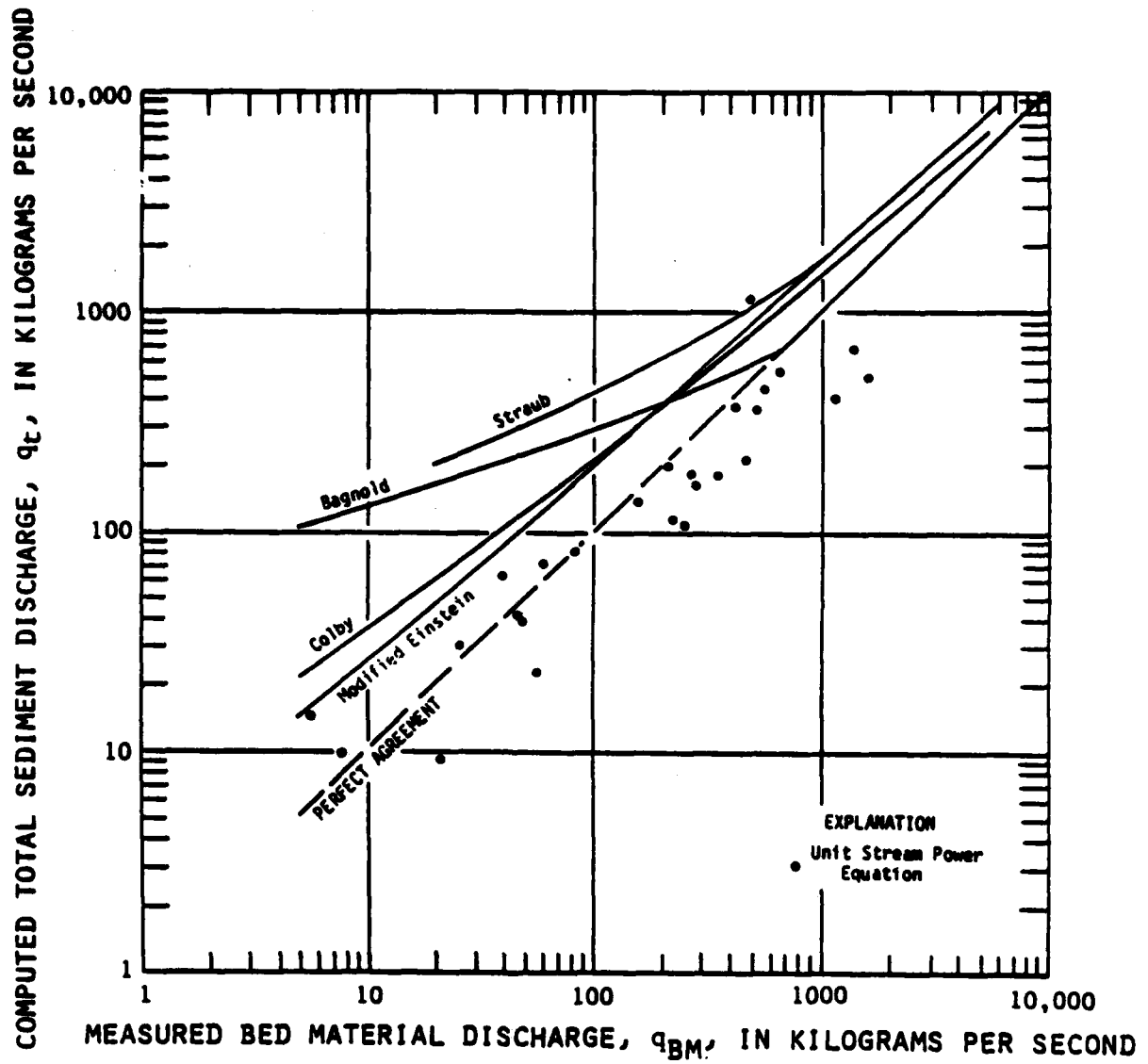


Figure 3.3. Yang's sediment transport equation for Mississippi River at St. Louis.

Table 3.4. Channel cross section plots at station 21,753.6 ft.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,					21753.6 FT DAY 8				
INDEX	HOR. DIST	CHANNEL CROSS SECTION PLOTS AT STATION	INDEX	HOR. DIST	INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
		ELEVATION							
(1)	0.	430.00	(7)	335.00	(13)	919.00	(13)	919.00	350.00
(2)	48.000	420.00	(8)	550.00	(14)	966.00	(14)	966.00	355.00
(3)	160.00	410.00	(9)	739.00	(15)	982.00	(15)	982.00	360.00
(4)	284.00	390.00	(10)	801.00	(16)	997.00	(16)	997.00	365.00
(5)	311.00	375.00	(11)	852.00	(17)	1017.0	(17)	1017.0	370.00
(6)	323.00	370.00	(12)	880.00	(18)	1048.0	(18)	1048.0	375.00

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,					21753.6 FT DAY 16				
INDEX	HOR. DIST	CHANNEL CROSS SECTION PLOTS AT STATION	INDEX	HOR. DIST	INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
		ELEVATION							
(1)	0.	430.00	(7)	335.00	(13)	919.00	(13)	919.00	349.88
(2)	48.000	420.00	(8)	550.00	(14)	966.00	(14)	966.00	354.88
(3)	160.00	410.00	(9)	739.00	(15)	982.00	(15)	982.00	359.88
(4)	284.00	390.00	(10)	801.00	(16)	997.00	(16)	997.00	364.88
(5)	311.00	375.00	(11)	852.00	(17)	1017.0	(17)	1017.0	369.88
(6)	323.00	370.00	(12)	880.00	(18)	1048.0	(18)	1048.0	374.88

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,					21753.6 FT DAY 24				
INDEX	HOR. DIST	CHANNEL CROSS SECTION PLOTS AT STATION	INDEX	HOR. DIST	INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
		ELEVATION							
(1)	0.	430.00	(7)	335.00	(13)	919.00	(13)	919.00	349.88
(2)	48.000	420.00	(8)	550.00	(14)	966.00	(14)	966.00	354.88
(3)	160.00	410.00	(9)	739.00	(15)	982.00	(15)	982.00	359.88
(4)	284.00	390.00	(10)	801.00	(16)	997.00	(16)	997.00	364.88
(5)	311.00	375.00	(11)	852.00	(17)	1017.0	(17)	1017.0	369.88
(6)	323.00	370.00	(12)	880.00	(18)	1048.0	(18)	1048.0	374.88

Table 3.4. Continued.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(7)	335.00	345.13	(13)	919.00	349.46	
(2)	48.000	420.00	(8)	550.00	340.13	(14)	966.00	354.46	
(3)	140.00	410.05	(9)	739.00	354.98	(15)	982.00	359.46	
(4)	284.00	380.13	(10)	801.00	349.46	(16)	997.00	364.46	
(5)	311.00	375.13	(11)	852.00	344.46	(17)	1017.0	369.46	
(6)	323.00	370.13	(12)	880.00	344.46	(18)	1048.0	374.46	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(7)	335.00	345.22	(13)	919.00	348.71	
(2)	48.000	420.00	(8)	550.00	360.59	(14)	966.00	353.71	
(3)	140.00	410.14	(9)	739.00	359.72	(15)	982.00	358.71	
(4)	284.00	380.22	(10)	801.00	348.71	(16)	997.00	363.71	
(5)	311.00	375.22	(11)	852.00	343.71	(17)	1017.0	368.71	
(6)	323.00	370.22	(12)	880.00	343.71	(18)	1048.0	373.71	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(7)	335.00	345.46	(13)	919.00	348.60	
(2)	48.000	420.00	(8)	550.00	360.83	(14)	966.00	353.60	
(3)	140.00	410.22	(9)	739.00	363.63	(15)	982.00	358.60	
(4)	284.00	380.46	(10)	801.00	348.60	(16)	997.00	363.60	
(5)	311.00	375.46	(11)	852.00	343.60	(17)	1017.0	368.60	
(6)	323.00	370.46	(12)	880.00	343.60	(18)	1048.0	373.60	

Table 3.4. Continued.

M A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A,				
INDEX	HOR. DIST	CHANNEL CROSS SECTION PLOTS AT STATION	21753.6 FT DAY 56	ELEVATION
		INDEX HOR. DIST ELEVATION	INDEX HOR. DIST	
(1)	0.	(7) 335.00 365.46	(13) 919.00	347.83
(2)	48.000	(8) 550.00 360.83	(14) 966.00	352.83
(3)	160.00	(9) 739.00 363.03	(15) 982.00	357.83
(4)	284.00	(10) 801.00 340.00	(16) 997.00	362.83
(5)	311.00	(11) 852.00 342.83	(17) 1017.0	367.83
(6)	323.00	(12) 880.00 342.83	(18) 1047.9	372.84
M A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A,				
INDEX	HOR. DIST	CHANNEL CROSS SECTION PLOTS AT STATION	21753.6 FT DAY 64	ELEVATION
		INDEX HOR. DIST ELEVATION	INDEX HOR. DIST	
(1)	0.	(7) 335.00 364.45	(13) 919.00	346.82
(2)	48.000	(8) 550.00 359.82	(14) 966.00	351.82
(3)	160.00	(9) 739.00 362.02	(15) 982.00	356.82
(4)	284.00	(10) 801.00 346.99	(16) 997.00	361.82
(5)	311.00	(11) 852.00 341.82	(17) 1017.0	366.82
(6)	323.00	(12) 880.00 341.82	(18) 1047.9	371.83
M A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A,				
INDEX	HOR. DIST	CHANNEL CROSS SECTION PLOTS AT STATION	21753.6 FT DAY 72	ELEVATION
		INDEX HOR. DIST ELEVATION	INDEX HOR. DIST	
(1)	0.	(7) 335.00 364.05	(13) 919.00	345.81
(2)	48.000	(8) 550.00 359.42	(14) 966.00	350.81
(3)	160.00	(9) 739.00 361.02	(15) 982.00	355.81
(4)	284.00	(10) 801.00 345.98	(16) 997.00	360.81
(5)	311.00	(11) 852.00 340.81	(17) 1017.0	365.81
(6)	323.00	(12) 880.00 340.81	(18) 1047.9	370.83

Table 3.5. Channel cross section plots at station 21,542.4 ft.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,					21542.4 FT DAY 8				
INDEX	HOR. DIST	CHANNEL CROSS SECTION PLOTS AT STATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(8)	374.00	360.00	(15)	821.00	350.00	
(2)	68.000	420.00	(9)	441.00	355.00	(16)	829.00	355.00	
(3)	175.00	410.00	(10)	535.00	350.00	(17)	837.00	360.00	
(4)	307.00	380.00	(11)	590.00	345.00	(18)	841.00	365.00	
(5)	331.00	375.00	(12)	727.00	340.00	(19)	846.00	370.00	
(6)	339.00	370.00	(13)	739.00	340.00	(20)	852.00	375.00	
(7)	354.00	365.00	(14)	797.00	345.00	(21)	855.99	380.00	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,					21542.4 FT DAY 16				
INDEX	HOR. DIST	CHANNEL CROSS SECTION PLOTS AT STATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(8)	374.00	359.99	(15)	821.00	349.69	
(2)	68.000	420.00	(9)	441.00	354.99	(16)	829.00	354.69	
(3)	175.00	410.00	(10)	535.00	349.84	(17)	837.00	359.69	
(4)	307.00	379.99	(11)	590.00	344.84	(18)	841.00	364.69	
(5)	331.00	374.99	(12)	727.00	339.69	(19)	846.00	369.69	
(6)	339.00	369.99	(13)	739.00	339.69	(20)	852.00	374.69	
(7)	354.00	364.99	(14)	797.00	344.69	(21)	855.99	379.69	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,					21542.4 FT DAY 24				
INDEX	HOR. DIST	CHANNEL CROSS SECTION PLOTS AT STATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(8)	374.00	359.99	(15)	821.00	349.68	
(2)	68.000	420.00	(9)	441.00	354.99	(16)	829.00	354.68	
(3)	175.00	410.00	(10)	535.00	349.84	(17)	837.00	359.68	
(4)	307.00	379.99	(11)	590.00	344.84	(18)	841.00	364.68	
(5)	331.00	374.99	(12)	727.00	339.68	(19)	846.00	369.68	
(6)	339.00	369.99	(13)	739.00	339.68	(20)	852.00	374.68	
(7)	354.00	364.99	(14)	797.00	344.68	(21)	855.98	379.68	

Table 3.5. Continued.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A:			CHANNEL CROSS SECTION PLOTS AT STATION			21542.4 FT DAY 32			ELEVATION
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(8)	374.00	359.94	(15)	821.00	349.21	
(2)	48.000	420.00	(9)	441.00	354.94	(16)	829.00	354.21	
(3)	175.00	409.95	(10)	535.00	351.42	(17)	837.00	359.21	
(4)	307.00	379.94	(11)	590.00	346.42	(18)	841.00	364.21	
(5)	331.00	374.94	(12)	727.00	339.21	(19)	846.00	369.21	
(6)	339.00	369.94	(13)	739.00	339.21	(20)	852.00	374.21	
(7)	354.00	364.94	(14)	797.00	344.21	(21)	855.97	379.21	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A:			CHANNEL CROSS SECTION PLOTS AT STATION			21542.4 FT DAY 40			ELEVATION
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(8)	374.00	359.48	(15)	821.00	352.31	
(2)	48.000	420.00	(9)	441.00	354.48	(16)	829.00	357.31	
(3)	175.00	409.49	(10)	535.00	353.43	(17)	837.00	362.31	
(4)	307.00	379.48	(11)	590.00	348.42	(18)	841.00	367.31	
(5)	331.00	374.48	(12)	727.00	342.31	(19)	846.00	372.31	
(6)	339.00	369.48	(13)	739.00	342.31	(20)	852.00	377.31	
(7)	354.00	364.48	(14)	797.00	347.31	(21)	855.96	382.31	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A:			CHANNEL CROSS SECTION PLOTS AT STATION			21542.4 FT DAY 48			ELEVATION
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(8)	374.00	359.51	(15)	821.00	351.13	
(2)	48.000	420.00	(9)	441.00	354.51	(16)	829.00	356.13	
(3)	175.00	409.49	(10)	535.00	351.99	(17)	837.00	361.13	
(4)	307.00	379.51	(11)	590.00	346.99	(18)	841.00	366.13	
(5)	331.00	374.51	(12)	727.00	341.13	(19)	846.00	371.13	
(6)	339.00	369.51	(13)	739.00	341.13	(20)	852.00	376.13	
(7)	354.00	364.51	(14)	797.00	346.13	(21)	855.95	381.14	

Table 3.5. Continued.

M A P A O U T P U T									
CHANNEL CROSS SECTION PLOTS AT STATION				POINTS PLOTTED FOR GRAPH, 1A,					
INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00		(8)	374.00	358.72	(15)	821.00	350.27
(2)	48.000	420.00		(9)	441.00	353.72	(16)	829.00	355.27
(3)	175.00	409.11		(10)	535.00	351.07	(17)	837.00	360.27
(4)	307.00	378.72		(11)	590.00	346.07	(18)	841.00	365.27
(5)	331.00	373.72		(12)	727.00	340.27	(19)	846.00	370.27
(6)	339.00	368.72		(13)	739.00	340.27	(20)	852.00	375.27
(7)	354.00	363.72		(14)	797.00	345.27	(21)	855.95	380.30

M A P A O U T P U T									
CHANNEL CROSS SECTION PLOTS AT STATION				POINTS PLOTTED FOR GRAPH, 1A,					
INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00		(8)	374.00	357.71	(15)	821.00	349.26
(2)	48.000	420.00		(9)	441.00	352.71	(16)	829.00	354.26
(3)	175.00	408.10		(10)	535.00	350.07	(17)	837.00	359.26
(4)	307.00	377.71		(11)	590.00	345.06	(18)	841.00	364.26
(5)	331.00	372.71		(12)	727.00	339.26	(19)	846.00	369.26
(6)	339.00	367.71		(13)	739.00	339.26	(20)	852.00	374.26
(7)	354.00	362.71		(14)	797.00	344.26	(21)	855.94	379.29

M A P A O U T P U T									
CHANNEL CROSS SECTION PLOTS AT STATION				POINTS PLOTTED FOR GRAPH, 1A,					
INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00		(8)	374.00	356.71	(15)	821.00	348.26
(2)	48.000	420.00		(9)	441.00	351.71	(16)	829.00	353.26
(3)	175.00	407.10		(10)	535.00	349.06	(17)	837.00	358.26
(4)	307.00	376.71		(11)	590.00	344.06	(18)	841.00	363.26
(5)	331.00	371.71		(12)	727.00	338.26	(19)	846.00	368.26
(6)	339.00	366.71		(13)	739.00	338.26	(20)	852.00	373.26
(7)	354.00	361.71		(14)	797.00	343.26	(21)	855.93	378.28

Table 3.6. Channel cross section plots at station 21,067.2 ft.

M A P A O U T P U T											
POINTS PLOTTED FOR GRAPH, 1A,											
CHANNEL CROSS SECTION PLOTS AT STATION			21067.2 FT DAY 8			21067.2 FT DAY 16			21067.2 FT DAY 24		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00	(8)	405.00	340.00	(15)	780.00	349.95	(22)	878.99	379.95
(2)	76.000	420.00	(9)	413.00	355.00	(16)	820.00	349.95	(23)	878.99	379.95
(3)	228.00	410.00	(10)	463.00	354.00	(17)	840.00	354.95	(24)	878.99	379.95
(4)	248.00	380.00	(11)	533.00	352.93	(18)	852.00	359.95	(25)	878.99	379.95
(5)	299.00	375.00	(12)	600.00	350.93	(19)	858.00	364.95	(26)	878.99	379.95
(6)	315.00	370.00	(13)	664.00	349.93	(20)	864.00	369.95	(27)	878.99	379.95
(7)	334.00	365.00	(14)	725.00	349.95	(21)	871.00	374.95	(28)	878.99	379.95
M A P A O U T P U T											
POINTS PLOTTED FOR GRAPH, 1A,											
CHANNEL CROSS SECTION PLOTS AT STATION			21067.2 FT DAY 16			21067.2 FT DAY 24			21067.2 FT DAY 32		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00	(8)	405.00	359.39	(15)	780.00	348.89	(22)	878.99	378.89
(2)	76.000	420.00	(9)	413.00	354.39	(16)	820.00	348.89	(23)	878.99	378.89
(3)	228.00	409.78	(10)	463.00	353.39	(17)	840.00	353.89	(24)	878.99	378.89
(4)	248.00	379.39	(11)	533.00	351.81	(18)	852.00	358.89	(25)	878.99	378.89
(5)	299.00	374.39	(12)	600.00	349.81	(19)	858.00	363.89	(26)	878.99	378.89
(6)	315.00	369.39	(13)	664.00	348.81	(20)	864.00	368.89	(27)	878.99	378.89
(7)	334.00	364.39	(14)	725.00	348.89	(21)	871.00	373.89	(28)	878.99	378.89
M A P A O U T P U T											
POINTS PLOTTED FOR GRAPH, 1A,											
CHANNEL CROSS SECTION PLOTS AT STATION			21067.2 FT DAY 16			21067.2 FT DAY 24			21067.2 FT DAY 32		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00	(8)	405.00	359.37	(15)	780.00	348.81	(22)	878.98	378.81
(2)	76.000	420.00	(9)	413.00	354.37	(16)	820.00	348.81	(23)	878.98	378.81
(3)	228.00	409.78	(10)	463.00	353.37	(17)	840.00	353.81	(24)	878.98	378.81
(4)	248.00	379.37	(11)	533.00	351.71	(18)	852.00	358.81	(25)	878.98	378.81
(5)	299.00	374.37	(12)	600.00	349.71	(19)	858.00	363.81	(26)	878.98	378.81
(6)	315.00	369.37	(13)	664.00	348.71	(20)	864.00	368.81	(27)	878.98	378.81
(7)	334.00	364.37	(14)	725.00	348.81	(21)	871.00	373.81	(28)	878.98	378.81

Table 3.6. Continued.

MAP OUTPUT					
POINTS PLOTTED FOR GRAPH. 1A.					
CHANNEL CROSS SECTION PLOTS AT STATION					
ELEVATION		INDEX HOR. DIST		ELEVATION	
INDEX	HOR. DIST			INDEX	HOR. DIST
(1)	0.	430.00	(8)	405.00	358.53
(2)	76.000	420.00	(9)	413.00	353.53
(3)	228.00	409.17	(10)	463.00	352.53
(4)	248.00	378.53	(11)	533.00	350.45
(5)	299.00	373.53	(12)	600.00	348.45
(6)	315.00	368.53	(13)	644.00	347.45
(7)	334.00	363.53	(14)	725.00	347.47
				(15)	780.00
				(16)	820.00
				(17)	840.00
				(18)	852.00
				(19)	858.00
				(20)	864.00
				(21)	871.00
				(22)	878.97
					347.47
					347.47
					352.47
					357.47
					362.47
					367.47
					372.47
					377.47

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH. 1A.									
CHANNEL CROSS SECTION PLOTS AT STATION					21067.2 FT DAY 40				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(8)	405.00	356.71	(15)	780.00	344.63	
(2)	76.000	420.00	(9)	413.00	351.71	(16)	820.00	344.63	
(3)	228.00	407.35	(10)	463.00	350.71	(17)	840.00	349.63	
(4)	248.00	376.71	(11)	533.00	347.56	(18)	852.00	354.63	
(5)	299.00	371.71	(12)	600.00	345.56	(19)	858.00	359.63	
(6)	315.00	366.71	(13)	664.00	344.56	(20)	864.00	364.63	
(7)	334.00	361.71	(14)	725.00	344.63	(21)	871.00	369.63	
						(22)	878.96	374.63	

M A P O U T P U T					
POINTS PLOTTED FOR GRAPH. 1A.					
CHANNEL CROSS SECTION PLOTS AT STATION					
ELEVATION				210+7.2 FT DAY 48	
INDEX	HOR. DIST		INDEX	HOR. DIST	ELEVATION
(1)	O.	439.00	(8)	405.00	354.10
(2)	76.000	420.00	(9)	413.00	351.10
(3)	228.00	406.79	(10)	463.00	350.10
(4)	248.00	374.10	(11)	533.00	345.77
(5)	299.00	371.10	(12)	600.00	343.77
(6)	315.00	364.10	(13)	644.00	342.77
(7)	334.00	341.10	(14)	725.00	343.03
			(15)	780.00	343.03
			(16)	820.00	343.03
			(17)	840.00	348.03
			(18)	852.00	353.03
			(19)	858.00	358.03
			(20)	864.00	363.03
			(21)	871.00	368.03
			(22)	878.95	373.03

Table 3.6. Continued.

M A P O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX		HOR. DIST		ELEVATION		INDEX		HOR. DIST	
(1)	0.	430.00	(8)	405.00	354.42	(15)	740.00	343.05	
(2)	74.000	420.00	(9)	413.00	351.42	(14)	820.00	343.05	
(3)	228.00	407.25	(10)	443.00	350.42	(17)	840.00	348.05	
(4)	248.00	374.42	(11)	533.00	345.88	(18)	852.00	353.05	
(5)	279.00	371.42	(12)	600.00	343.88	(19)	858.00	358.05	
(6)	315.00	364.42	(13)	644.00	342.88	(20)	844.00	363.05	
(7)	334.00	361.42	(14)	725.00	343.05	(21)	871.00	368.05	
						(22)	878.95	373.05	

M A P O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A,					
CHANNEL CROSS SECTION PLOTS AT STATION					
ELEVATION		INDEX		HOR. DIST	
INDEX	NOR. DIST	ELEVATION	INDEX	NOR. DIST	ELEVATION
(1)	0.	430.00	(8)	405.00	355.69
(2)	76.000	420.00	(9)	413.00	350.69
(3)	228.00	406.32	(10)	463.00	349.69
(4)	248.00	375.69	(11)	533.00	344.87
(5)	299.00	370.69	(12)	600.00	342.87
(6)	315.00	365.69	(13)	664.00	341.87
(7)	334.00	360.69	(14)	725.00	342.04
			(15)	780.00	342.04
			(16)	820.00	342.04
			(17)	840.00	347.04
			(18)	852.00	352.04
			(19)	858.00	357.04
			(20)	864.00	362.04
			(21)	871.00	367.04
			(22)	878.94	372.04

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
21047.2 FT DAY 72									
INDEX HOR. DIST ELEVATION INDEX HOR. DIST ELEVATION									
(1)	0.	430.00	(8)	405.00	355.97	(15)	780.00	341.03	
(2)	76.000	420.00	(9)	413.00	350.97	(16)	820.00	341.03	
(3)	228.00	406.60	(10)	463.00	349.97	(17)	840.00	346.03	
(4)	248.00	375.97	(11)	531.00	343.89	(18)	852.00	351.03	
(5)	299.00	370.97	(12)	600.00	341.89	(19)	85.00	356.03	
(6)	315.00	365.97	(13)	664.00	340.89	(20)	864.00	361.03	
(7)	334.00	360.97	(14)	725.00	341.03	(21)	871.00	366.03	
						(22)	878.91	371.03	

Table 3.7. Channel cross section plots at station 20,697.6 ft.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION					20697.6 FT DAY 8				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(7)	399.00	344.96	(13)	770.00	359.83	
(2)	76.000	420.00	(8)	470.00	359.96	(14)	834.00	359.84	
(3)	258.00	410.00	(9)	540.00	359.96	(15)	870.00	362.84	
(4)	324.00	379.96	(10)	600.00	359.79	(16)	897.00	364.84	
(5)	348.00	374.96	(11)	650.00	359.79	(17)	905.00	369.84	
(6)	387.00	369.96	(12)	700.00	359.79	(18)	913.00	374.84	
						(19)	923.99	379.86	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION					20697.6 FT DAY 16				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(7)	399.00	364.10	(13)	770.00	358.41	
(2)	76.000	420.00	(8)	470.00	359.09	(14)	834.00	358.41	
(3)	258.00	409.71	(9)	540.00	359.06	(15)	870.00	361.41	
(4)	324.00	379.10	(10)	600.00	358.23	(16)	897.00	363.41	
(5)	348.00	374.10	(11)	650.00	358.23	(17)	905.00	368.41	
(6)	387.00	369.10	(12)	700.00	358.24	(18)	913.00	373.41	
						(19)	923.98	378.43	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION					20697.6 FT DAY 24				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(7)	399.00	364.04	(13)	770.00	358.22	
(2)	76.000	420.00	(8)	470.00	359.04	(14)	834.00	358.22	
(3)	258.00	409.71	(9)	540.00	359.01	(15)	870.00	361.22	
(4)	324.00	379.04	(10)	600.00	358.01	(16)	897.00	363.22	
(5)	348.00	374.04	(11)	650.00	358.01	(17)	905.00	368.22	
(6)	387.00	369.04	(12)	700.00	358.01	(18)	913.00	373.22	
						(19)	923.98	378.24	

Table 3.7. Continued.

M A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A,				
CHANNEL CROSS SECTION PLOTS AT STATION		20697.6 FT DAY 32		
INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
(1)	0.	(7)	399.00	342.91
(2)	74.000	(8)	470.00	357.91
(3)	258.00	(9)	540.00	357.79
(4)	324.00	(10)	600.00	356.43
(5)	348.00	(11)	650.00	356.43
(6)	387.00	(12)	700.00	356.43
		(13)	770.00	356.70
		(14)	834.00	356.70
		(15)	870.00	359.70
		(16)	897.00	361.70
		(17)	905.00	366.70
		(18)	913.00	371.70
		(19)	923.97	376.72

M A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A,				
CHANNEL CROSS SECTION PLOTS AT STATION		20697.6 FT DAY 40		
INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
(1)	0.	(7)	399.00	340.67
(2)	74.000	(8)	470.00	355.67
(3)	258.00	(9)	540.00	355.10
(4)	324.00	(10)	600.00	353.49
(5)	348.00	(11)	650.00	353.49
(6)	387.00	(12)	700.00	353.49
		(13)	770.00	353.82
		(14)	834.00	353.82
		(15)	870.00	356.82
		(16)	897.00	358.82
		(17)	905.00	363.82
		(18)	913.00	368.82
		(19)	923.96	373.85

M A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A,				
CHANNEL CROSS SECTION PLOTS AT STATION		20697.6 FT DAY 48		
INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
(1)	0.	(7)	399.00	359.54
(2)	74.000	(8)	470.00	354.54
(3)	258.00	(9)	540.00	353.97
(4)	324.00	(10)	600.00	351.35
(5)	348.00	(11)	650.00	351.35
(6)	387.00	(12)	700.00	351.35
		(13)	770.00	351.93
		(14)	834.00	351.93
		(15)	870.00	354.93
		(16)	897.00	356.93
		(17)	905.00	361.93
		(18)	913.00	366.93
		(19)	923.95	371.95

Table 3.7. Continued.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A:									
CHANNEL CROSS SECTION		PLOTS AT STATION		20697.6 FT DAY 56		ELEVATION		ELEVATION	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00	(7)	399.00	(13)	770.00	(13)	770.00	351.06
(2)	74.000	420.00	(8)	470.00	(14)	834.00	(14)	834.00	351.06
(3)	258.00	404.81	(9)	540.00	(15)	870.00	(15)	870.00	354.06
(4)	324.00	373.72	(10)	600.00	(16)	897.00	(16)	897.00	356.06
(5)	348.00	348.72	(11)	650.00	(17)	905.00	(17)	905.00	361.06
(6)	387.00	363.72	(12)	700.00	(18)	913.00	(18)	913.00	366.06
					(19)	923.95	(19)	923.95	371.09

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A:									
CHANNEL CROSS SECTION		PLOTS AT STATION		20697.6 FT DAY 64		ELEVATION		ELEVATION	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00	(7)	399.00	(13)	770.00	(13)	770.00	350.06
(2)	74.000	420.00	(8)	470.00	(14)	834.00	(14)	834.00	350.06
(3)	258.00	403.80	(9)	540.00	(15)	870.00	(15)	870.00	353.06
(4)	324.00	372.71	(10)	600.00	(16)	897.00	(16)	897.00	355.06
(5)	348.00	367.71	(11)	650.00	(17)	905.00	(17)	905.00	360.06
(6)	387.00	362.71	(12)	700.00	(18)	913.00	(18)	913.00	365.06
					(19)	923.94	(19)	923.94	370.08

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A:									
CHANNEL CROSS SECTION		PLOTS AT STATION		20697.6 FT DAY 72		ELEVATION		ELEVATION	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00	(7)	399.00	(13)	770.00	(13)	770.00	349.05
(2)	74.000	420.00	(8)	470.00	(14)	834.00	(14)	834.00	349.05
(3)	258.00	402.79	(9)	540.00	(15)	870.00	(15)	870.00	352.05
(4)	324.00	371.70	(10)	600.00	(16)	897.00	(16)	897.00	354.05
(5)	348.00	366.70	(11)	650.00	(17)	905.00	(17)	905.00	359.05
(6)	387.00	361.70	(12)	700.00	(18)	913.00	(18)	913.00	364.05
					(19)	923.93	(19)	923.93	369.07

Table 3.8. Channel cross section plots at station 20,222.4 ft.

M A P A O U T P U T									
CHANNEL CROSS SECTION PLOTS AT STATION			POINTS PLOTTED FOR GRAPH, 1A,			20222.4 FT DAY 8			ELEVATION
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(7)	454.00	345.00	(13)	840.00	359.97	
(2)	74.000	420.00	(8)	512.00	343.00	(14)	890.00	359.97	
(3)	289.00	410.00	(9)	597.00	340.00	(15)	917.00	359.97	
(4)	377.00	380.00	(10)	670.00	359.95	(16)	928.00	344.97	
(5)	440.00	373.00	(11)	738.00	359.94	(17)	940.00	369.97	
(6)	450.00	370.00	(12)	790.00	359.97	(18)	950.00	374.97	
						(19)	970.00	374.97	
						(20)	984.99	382.98	

M A P A O U T P U T									
CHANNEL CROSS SECTION PLOTS AT STATION			POINTS PLOTTED FOR GRAPH, 1A,			20222.4 FT DAY 16			ELEVATION
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(7)	454.00	344.54	(13)	840.00	359.20	
(2)	74.000	420.00	(8)	512.00	342.54	(14)	890.00	359.20	
(3)	289.00	409.83	(9)	597.00	359.43	(15)	917.00	359.20	
(4)	377.00	379.54	(10)	670.00	359.04	(16)	928.00	364.20	
(5)	440.00	374.54	(11)	738.00	359.04	(17)	940.00	369.20	
(6)	450.00	369.54	(12)	790.00	359.20	(18)	950.00	374.20	
						(19)	970.00	379.20	
						(20)	984.99	382.20	

M A P A O U T P U T									
CHANNEL CROSS SECTION PLOTS AT STATION			POINTS PLOTTED FOR GRAPH, 1A,			20222.4 FT DAY 24			ELEVATION
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(7)	454.00	364.52	(13)	840.00	359.12	
(2)	74.000	420.00	(8)	512.00	362.52	(14)	890.00	359.12	
(3)	289.00	409.83	(9)	597.00	359.41	(15)	917.00	359.12	
(4)	377.00	379.52	(10)	670.00	358.92	(16)	928.00	364.12	
(5)	440.00	374.52	(11)	738.00	358.92	(17)	940.00	369.12	
(6)	450.00	369.52	(12)	790.00	359.11	(18)	950.00	374.12	
						(19)	970.00	379.12	
						(20)	984.98	382.12	

Table 3.8. Continued.

M A P O U T P U T											
POINTS PLOTTED FOR GRAPH, 1A,											
CHANNEL CROSS SECTION PLOTS AT STATION											
INDEX		HOR. DIST		ELEVATION		INDEX		HOR. DIST		ELEVATION	
20222.4 FT DAY 32											
(1)	0.			(7)	454.00			(13)	840.00		357.85
(2)	76.000		430.00	(8)	512.00		363.77	(14)	890.00		357.85
(3)	289.00		420.00	(9)	597.00		361.77	(15)	917.00		357.85
(4)	377.00		409.30	(10)	670.00		358.31	(16)	928.00		362.85
(5)	440.00		378.77	(11)	738.00		357.55	(17)	940.00		347.85
(6)	450.00		373.77	(12)	790.00		357.85	(18)	950.00		372.85
			368.77					(19)	970.00		377.85
								(20)	984.97		380.85

[illegible]

MAP OUTPUT			
POINTS PLOTTED FOR GRAPH, 1A,			
CHANNEL CROSS SECTION PLOTS AT STATION			
20222.4 FT DAY 48			
INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(7) 456.00
(2)	76.000	420.00	(8) 512.00
(3)	289.00	406.97	(9) 597.00
(4)	377.00	376.36	(10) 670.00
(5)	440.00	371.36	(11) 738.00
(6)	450.00	366.36	(12) 790.00
			(13) 840.00
			(14) 890.00
			(15) 917.00
			(16) 928.00
			(17) 940.00
			(18) 950.00
			(19) 970.00
			(20) 9114.95
			376.46
			353.45
			353.46
			358.46
			363.46
			368.46
			373.46
			376.46

Table 3.8. Continued.

M A P O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
20222.4 FT DAY 56									
INDEX HOR. DIST ELEVATION INDEX HOR. DIST ELEVATION									
(1)	0.	430.00	(7)	456.00	360.73	(13)	840.00	352.70	
(2)	76.000	420.00	(8)	512.00	359.73	(14)	890.00	352.70	
(3)	289.00	404.34	(9)	597.00	354.42	(15)	917.00	352.70	
(4)	377.00	375.73	(10)	670.00	352.03	(16)	928.00	357.70	
(5)	440.00	370.73	(11)	738.00	352.03	(17)	940.00	342.70	
(6)	450.00	365.73	(12)	790.00	352.70	(18)	950.00	347.70	
						(19)	970.00	372.70	
						(20)	984.95	375.70	

M A P O U T P U T									
CHANNEL CROSS SECTION			POINTS PLOTTED FOR GRAPH, 1A, DISTANCE PLOTS AT STATION			20222.4 FT DAY 64			
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(7)	456.00	359.72	(13)	640.00	351.69	
(2)	76.000	420.00	(8)	512.00	357.72	(14)	890.00	351.69	
(3)	289.00	405.36	(9)	597.00	353.42	(15)	917.00	351.69	
(4)	377.00	374.72	(10)	670.00	351.03	(16)	928.00	352.69	
(5)	440.00	369.72	(11)	738.00	351.03	(17)	940.00	361.69	
(6)	450.00	364.72	(12)	790.00	351.69	(18)	950.00	366.69	
						(19)	970.00	371.69	
						(20)	984.94	374.70	

M A P O U T P U T									
CHANNEL CROSS SECTION			POINTS PLOTTED FOR GRAPH, 1A,			20222.4 FT DAY 72			
INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(7)	454.00	358.72	(13)	840.00	350.69	
(2)	74.000	420.00	(8)	512.00	354.72	(14)	890.00	350.69	
(3)	289.00	404.36	(9)	597.00	352.41	(15)	917.00	350.69	
(4)	377.00	373.72	(10)	470.00	350.02	(16)	928.00	355.69	
(5)	440.00	348.72	(11)	738.00	350.02	(17)	940.00	340.69	
(6)	450.00	343.72	(12)	790.00	350.68	(18)	950.00	345.69	
						(19)	970.00	370.69	
						(20)	984.93	373.59	

Table 3.9. Channel cross section plots at station 19,377.6 ft.

M A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A.				
CHANNEL CROSS SECTION PLOTS AT STATION		19377.6 FT DAY 8		
INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
(1)	0.	(5)	445.00	374.97
(2)	83.000	(6)	454.00	369.97
(3)	341.00	(7)	480.00	364.97
(4)	417.00	(8)	523.00	359.97
		(9)	649.00	364.95
		(10)	878.00	374.97
		(11)	1045.0	368.97
		(12)	1105.0	371.98

M A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A.				
CHANNEL CROSS SECTION PLOTS AT STATION		19377.6 FT DAY 16		
INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
(1)	0.	(5)	445.00	374.54
(2)	83.000	(6)	456.00	369.54
(3)	341.00	(7)	480.00	364.54
(4)	417.00	(8)	523.00	359.54
		(9)	649.00	364.31
		(10)	878.00	374.34
		(11)	1045.0	368.34
		(12)	1105.0	371.34

M A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A.				
CHANNEL CROSS SECTION PLOTS AT STATION		19377.6 FT DAY 24		
INDEX	HOR. DIST	INDEX	HOR. DIST	ELEVATION
(1)	0.	(5)	445.00	374.50
(2)	83.000	(6)	456.00	369.50
(3)	341.00	(7)	480.00	364.50
(4)	417.00	(8)	523.00	359.50
		(9)	649.00	364.24
		(10)	878.00	374.29
		(11)	1045.0	368.29
		(12)	1105.0	371.30

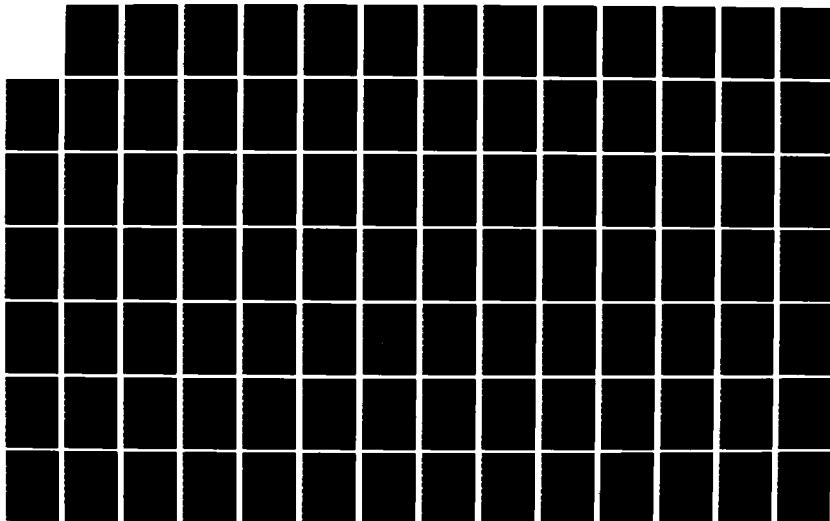
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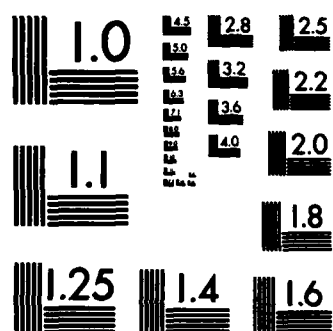
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DAM NUMBER 26 (REPLA. (U) COLORADO STATE UNIV FORT
COLLINS DEPT OF CIVIL ENGINEERING A MOLINAS OCT 83
CER83-84AM-15 DACW43-83-C-0054 F/G 8/8

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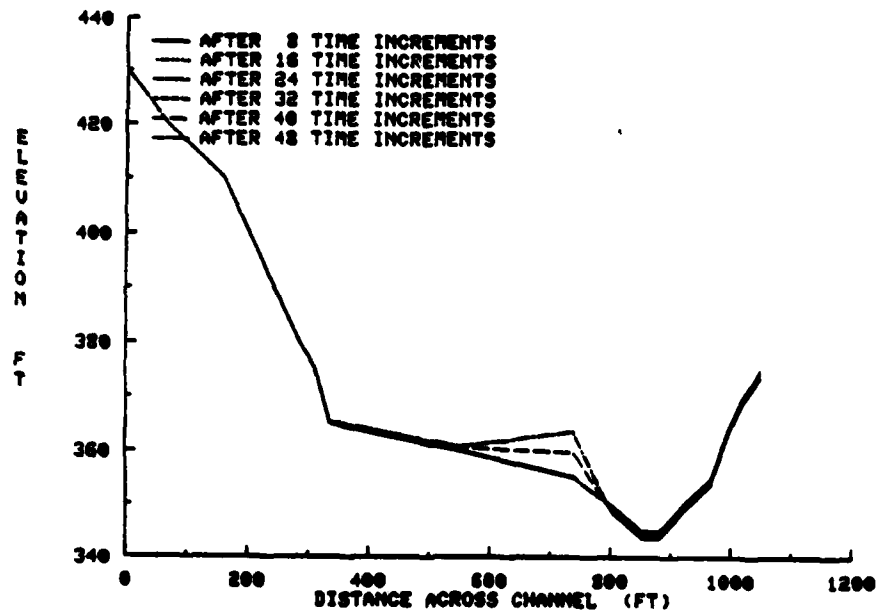
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Table 3.9. Continued.

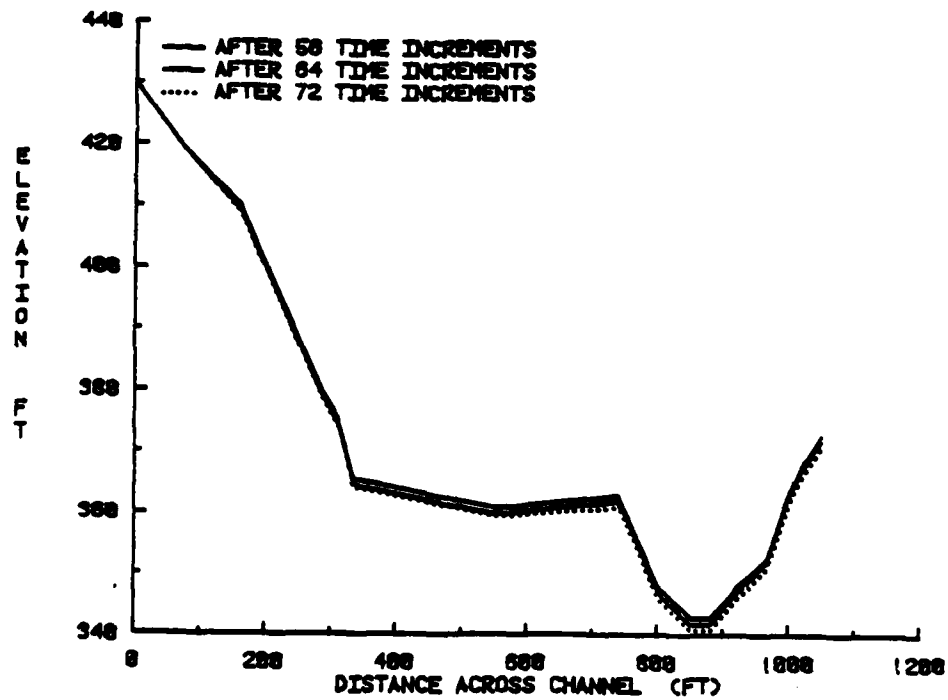
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,				19377.6 FT DAY 32					
CHANNEL CROSS SECTION PLOTS AT STATION		INDEX		HOR. DIST		INDEX		HOR. DIST	
INDEX	HOR. DIST	ELEVATION							ELEVATION
(1)	0.	430.00	(5)	445.00	373.80	(9)	649.00		363.16
(2)	83.000	420.00	(6)	456.00	368.80	(10)	878.00		373.49
(3)	341.00	409.39	(7)	480.00	343.80	(11)	1045.0		367.49
(4)	417.00	378.80	(8)	523.00	358.80	(12)	1105.0		370.50
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,				19377.6 FT DAY 40					
CHANNEL CROSS SECTION PLOTS AT STATION		INDEX		HOR. DIST		INDEX		HOR. DIST	
INDEX	HOR. DIST	ELEVATION							ELEVATION
(1)	0.	430.00	(5)	445.00	372.44	(9)	649.00		360.61
(2)	83.000	420.00	(6)	456.00	367.44	(10)	878.00		371.12
(3)	341.00	408.03	(7)	480.00	362.44	(11)	1045.0		365.12
(4)	417.00	377.44	(8)	523.00	357.44	(12)	1105.0		368.13
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,				19377.6 FT DAY 4B					
CHANNEL CROSS SECTION PLOTS AT STATION		INDEX		HOR. DIST		INDEX		HOR. DIST	
INDEX	HOR. DIST	ELEVATION							ELEVATION
(1)	0.	430.00	(5)	445.00	371.73	(9)	649.00		359.31
(2)	83.000	420.00	(6)	456.00	366.73	(10)	878.00		370.03
(3)	341.00	407.43	(7)	480.00	361.73	(11)	1045.0		364.03
(4)	417.00	376.73	(8)	523.00	356.73	(12)	1105.0		367.03

Table 3.9. Continued.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,				19377.6 FT DAY 56					
CHANNEL CROSS SECTION PLOTS AT STATION		ELEVATION		INDEX		HOR. DIST		DIST	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(5)	445.00	371.04	(9)	649.00	358.67	
(2)	83.000	420.00	(6)	456.00	366.04	(10)	878.00	369.48	
(3)	341.00	406.85	(7)	480.00	361.04	(11)	1045.0	363.48	
(4)	417.00	376.04	(8)	523.00	356.04	(12)	1104.9	366.49	
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,				19377.6 FT DAY 64					
CHANNEL CROSS SECTION PLOTS AT STATION		ELEVATION		INDEX		HOR. DIST		DIST	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(5)	445.00	370.04	(9)	649.00	357.67	
(2)	83.000	420.00	(6)	456.00	365.04	(10)	878.00	368.48	
(3)	341.00	405.85	(7)	480.00	360.04	(11)	1045.0	362.48	
(4)	417.00	375.04	(8)	523.00	355.04	(12)	1104.9	365.48	
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,				19377.6 FT DAY 72					
CHANNEL CROSS SECTION PLOTS AT STATION		ELEVATION		INDEX		HOR. DIST		DIST	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(5)	445.00	369.07	(9)	649.00	356.66	
(2)	83.000	420.00	(6)	456.00	364.07	(10)	878.00	367.65	
(3)	341.00	404.88	(7)	480.00	359.07	(11)	1045.0	361.65	
(4)	417.00	374.07	(8)	523.00	354.07	(12)	1104.9	364.66	

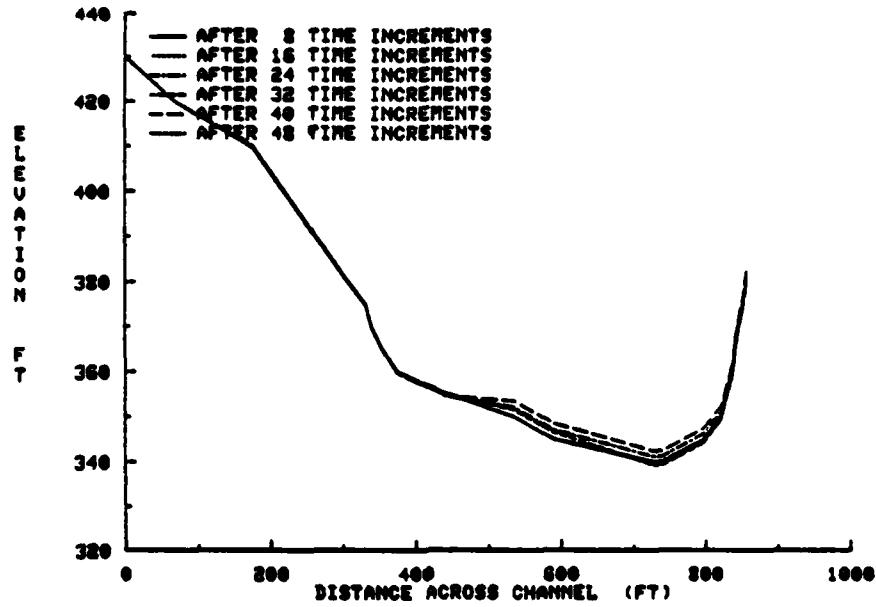


(a)

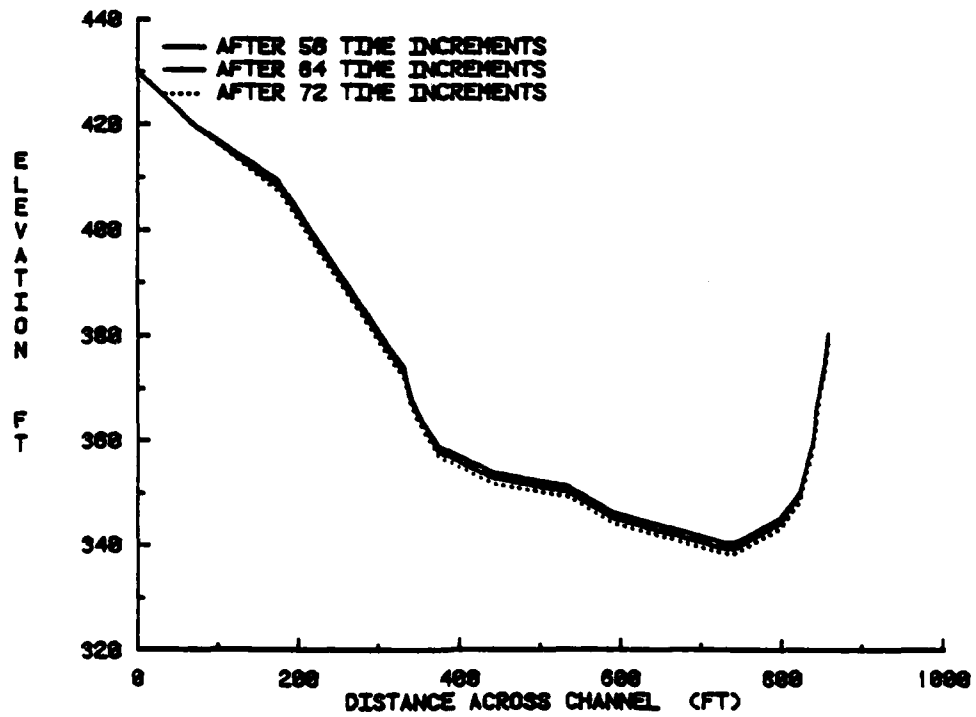


(b)

Figure 3.4. Channel cross section plots at station 21,753.6 ft.

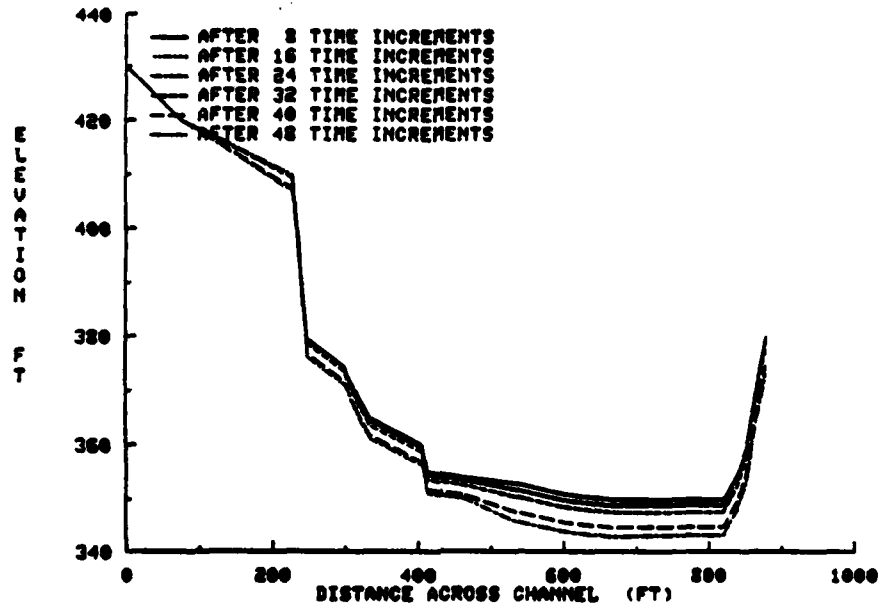


(a)

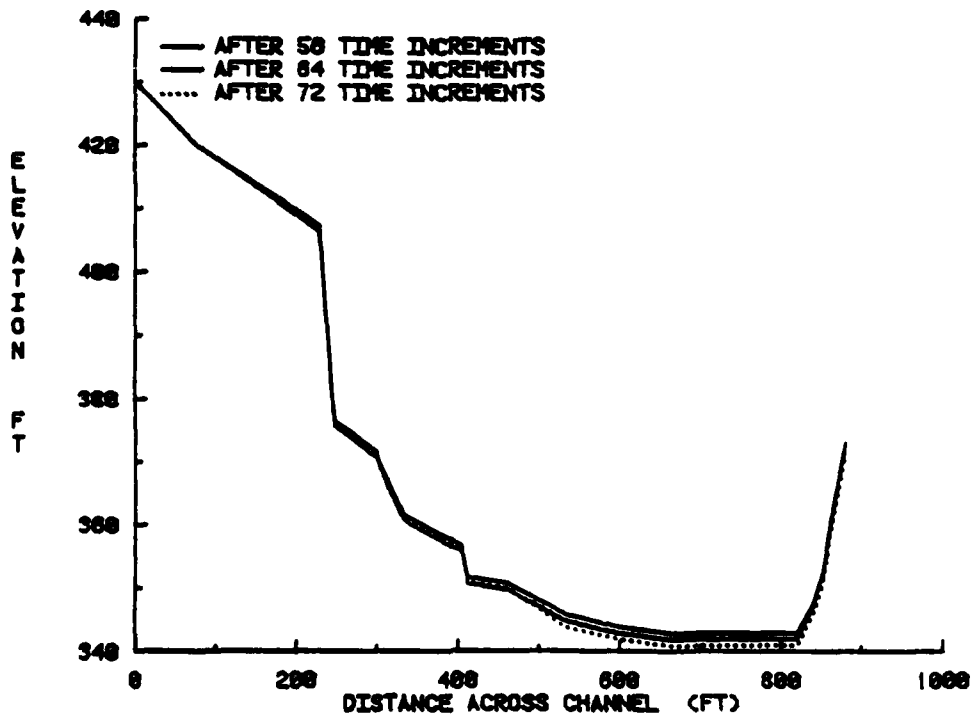


(b)

Figure 3.5. Channel cross section plots at station 21,542.4 ft.

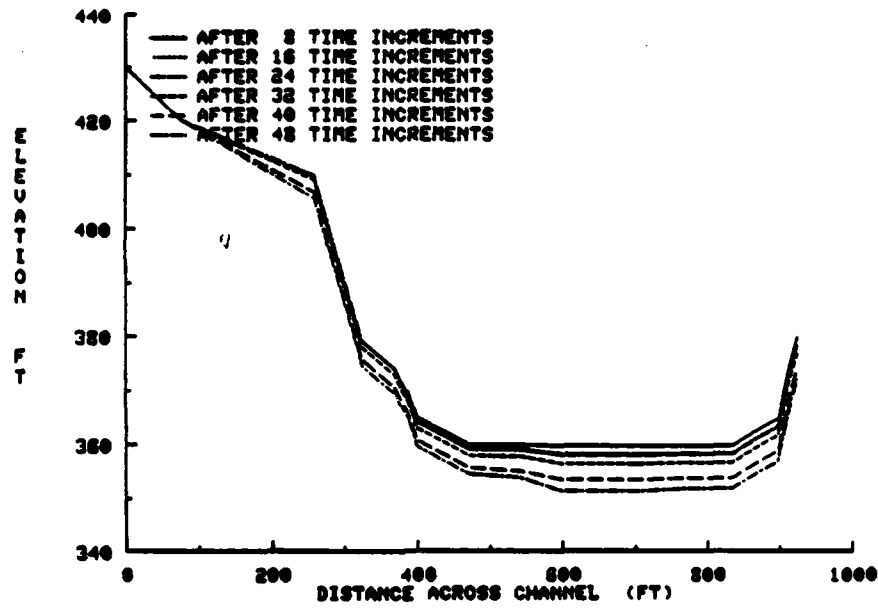


(a)

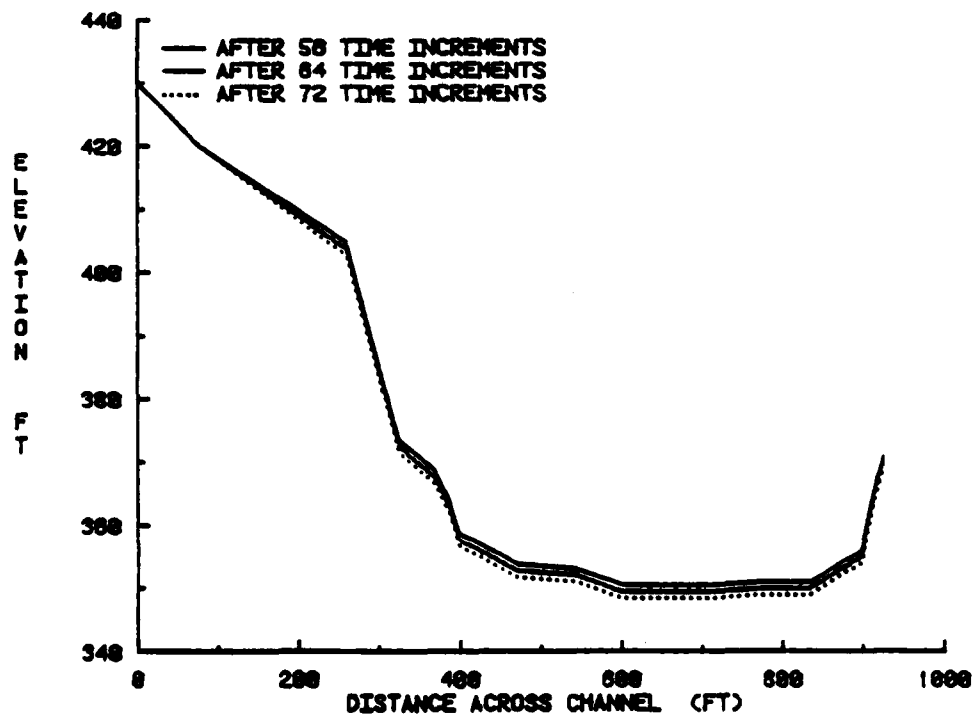


(b)

Figure 3.6. Channel cross section plots at station 21,067.2 ft.

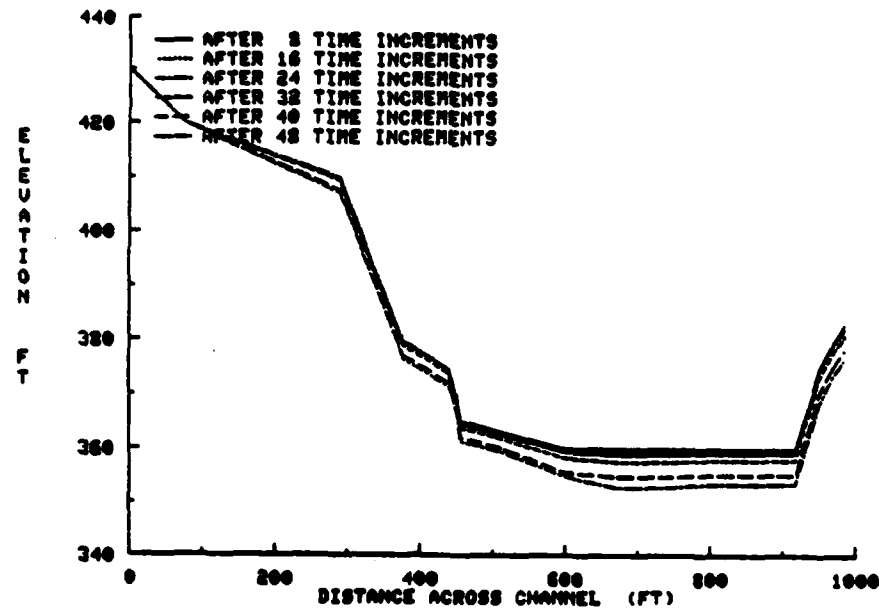


(a)

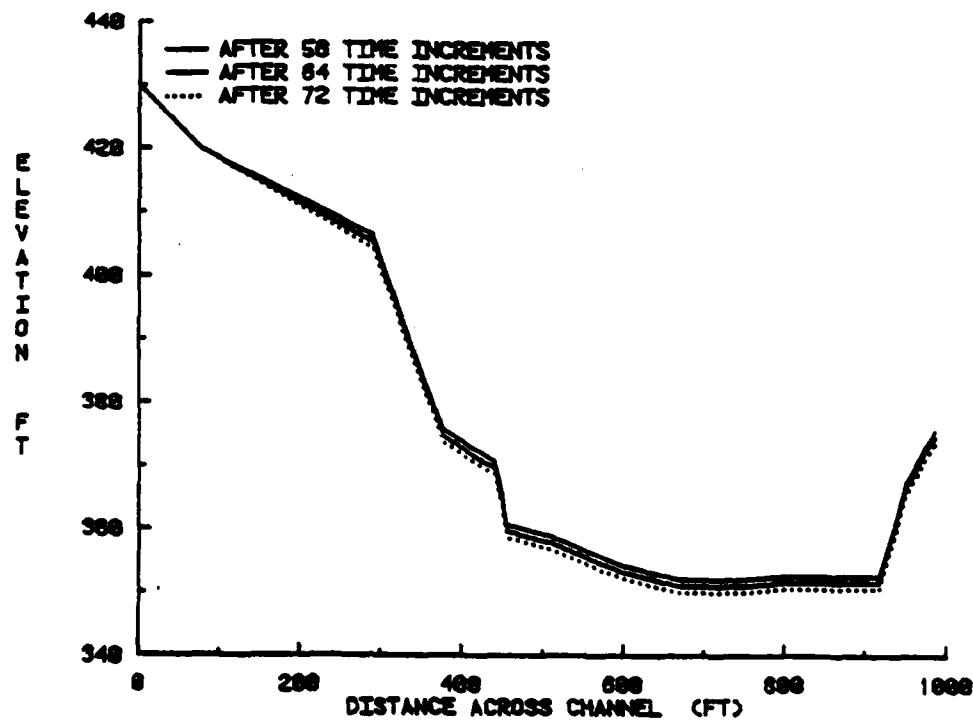


(b)

Figure 3.7. Channel cross section plots at station 20,697.6 ft.

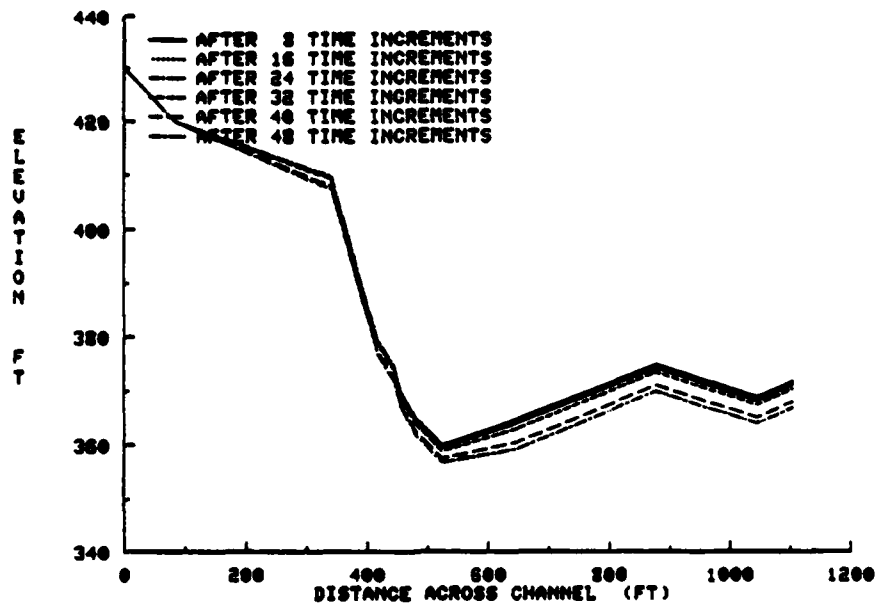


(a)

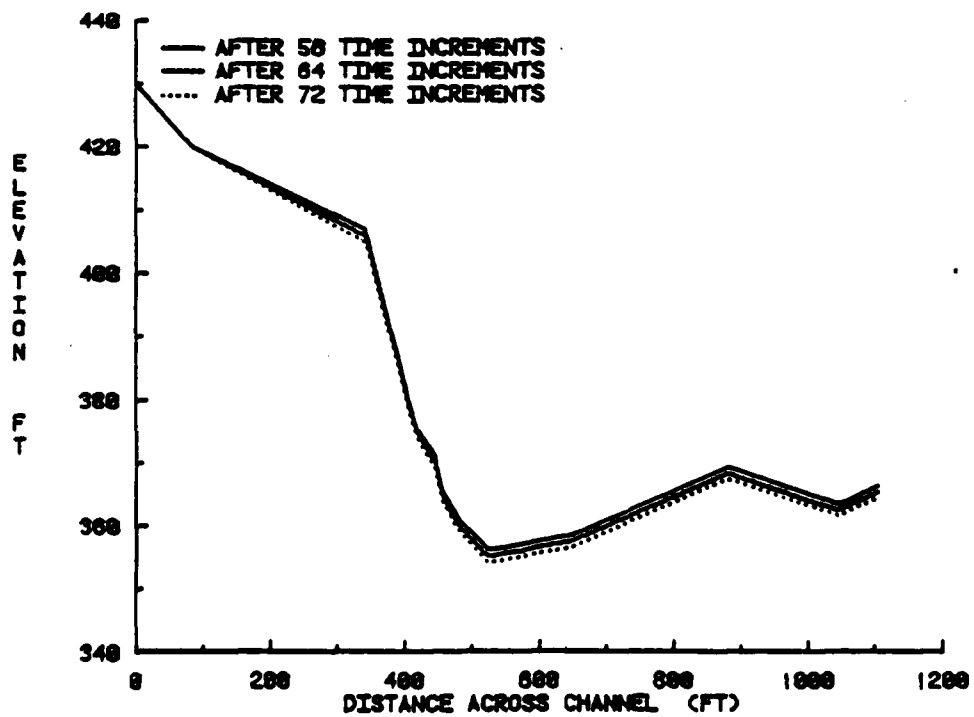


(b)

Figure 3.8. Channel cross section plots at station 20,222.4 ft.

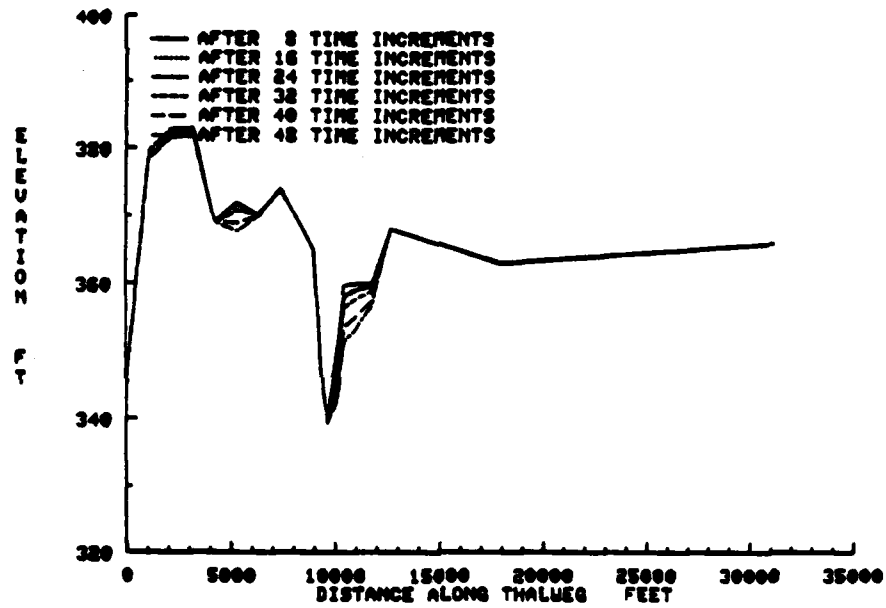


(a)

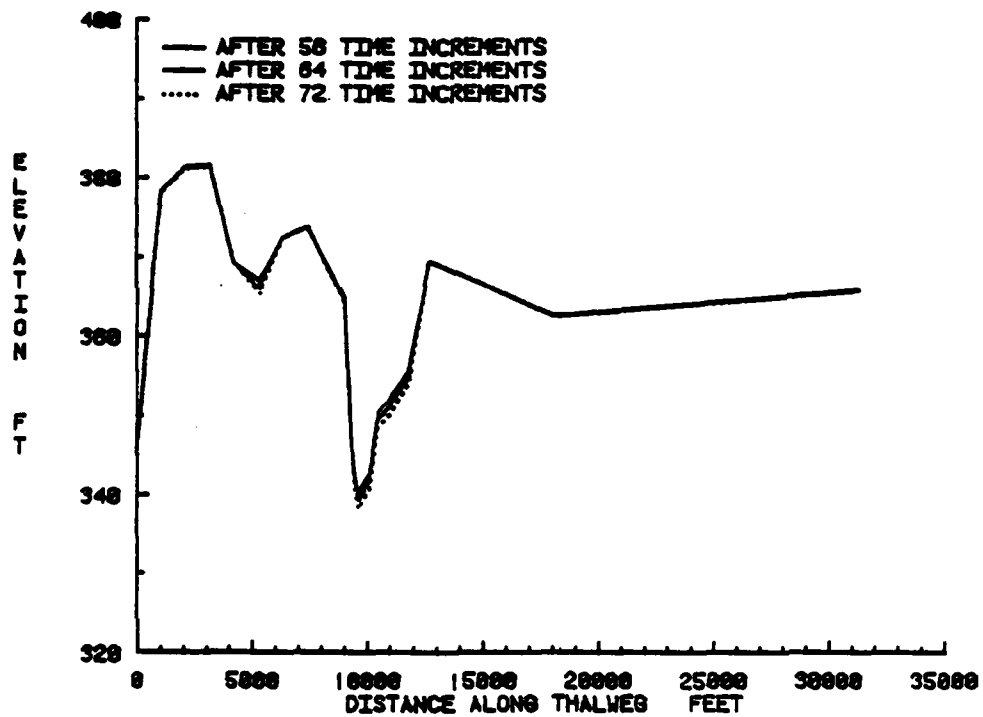


(b)

Figure 3.9. Channel cross section plots at station 19,377.6 ft.

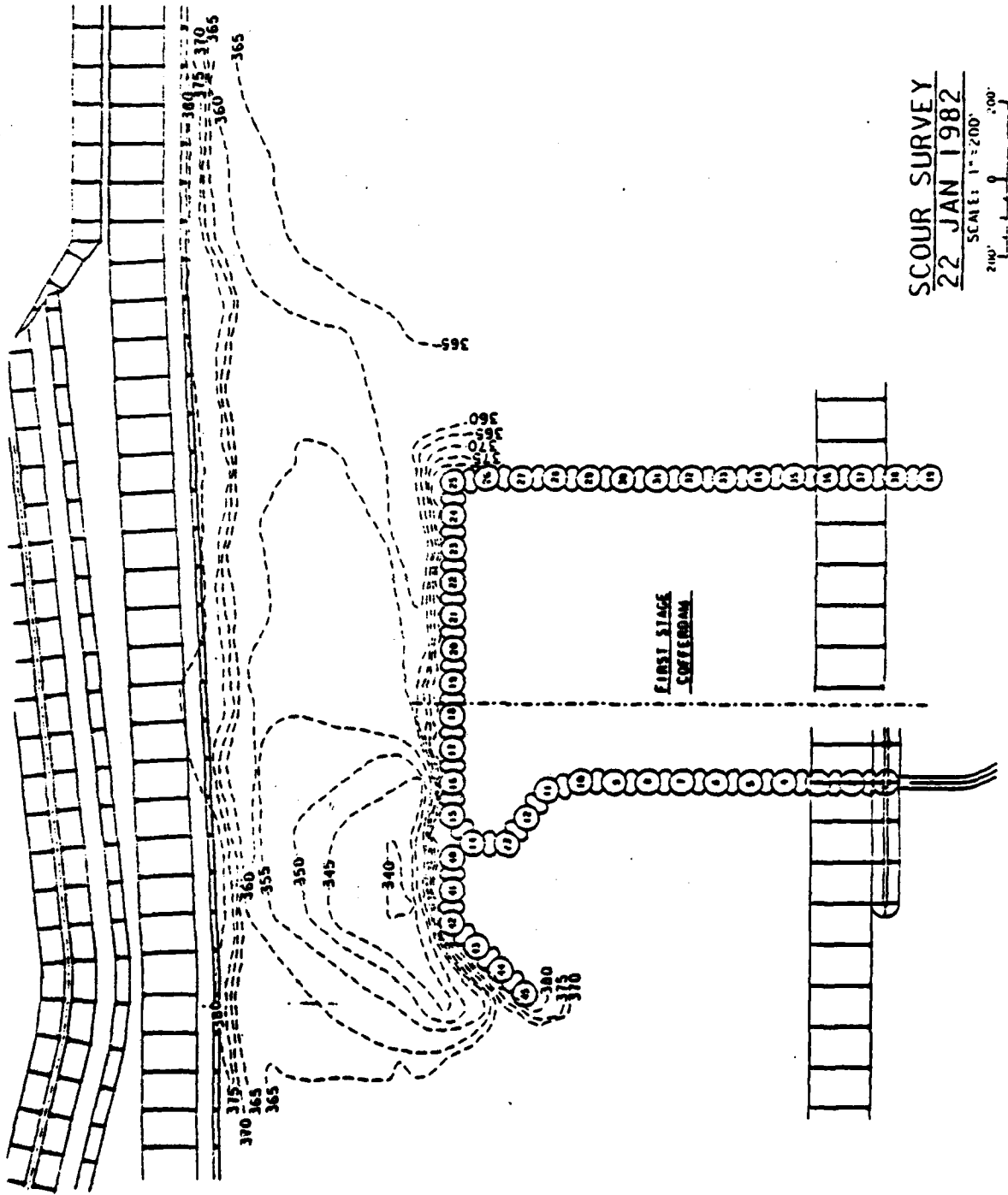


(a)



(b)

Figure 3.10. Thalweg profile along Mississippi River RM 196.8 - 202.7.



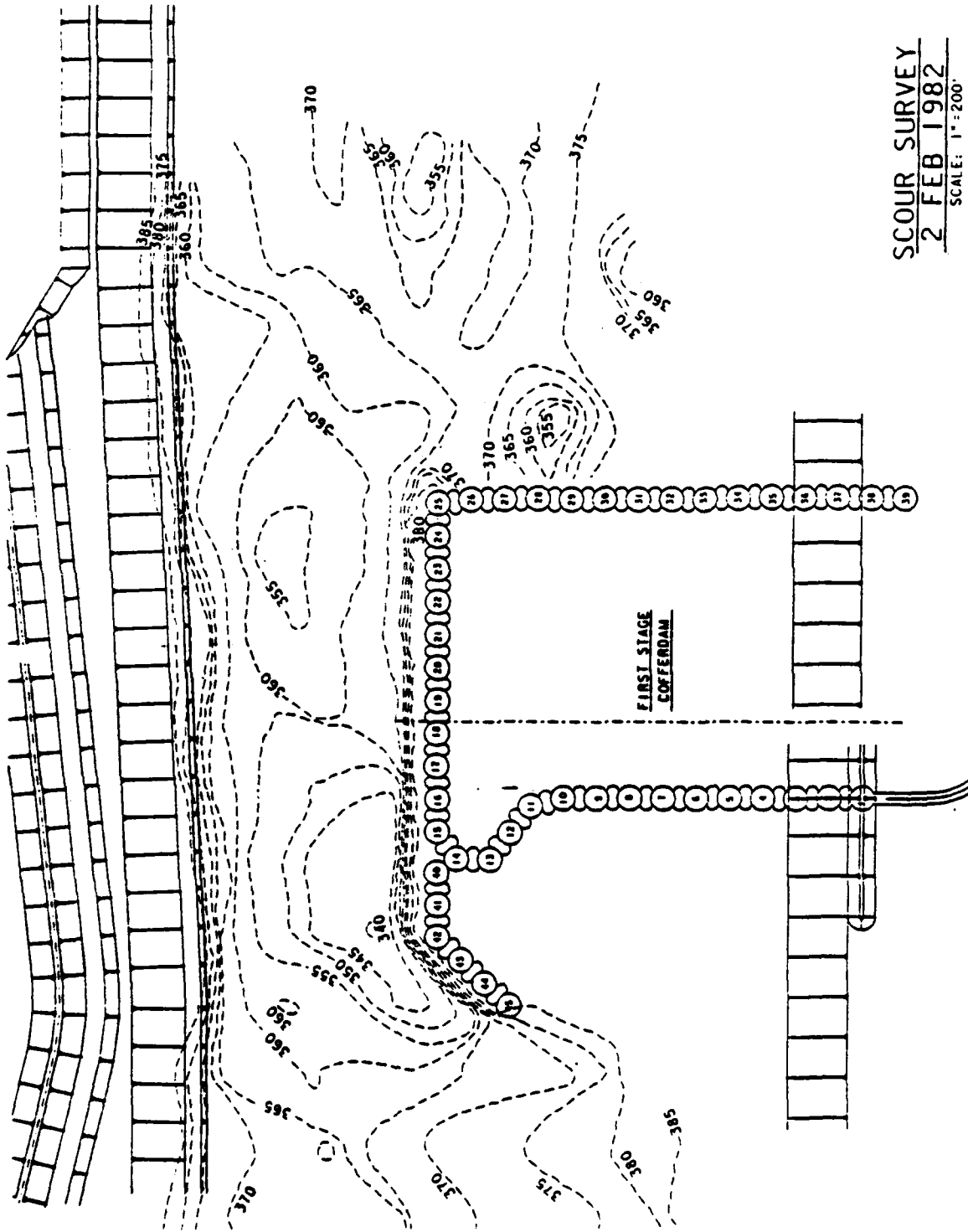


Figure 3.12. Measured contour lines (2 February 1982).

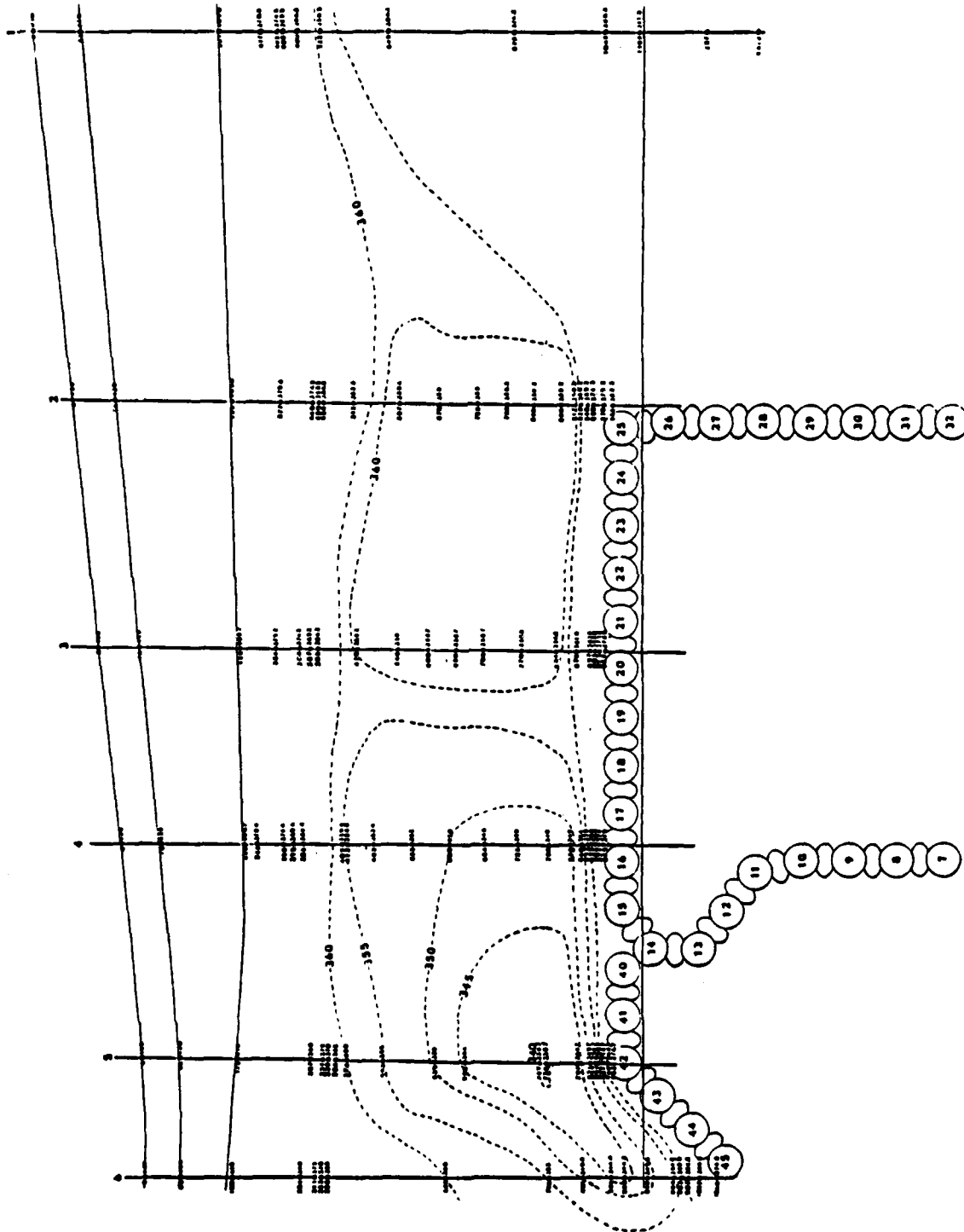


Figure 3.13. Computed contour lines (2 February 1982).

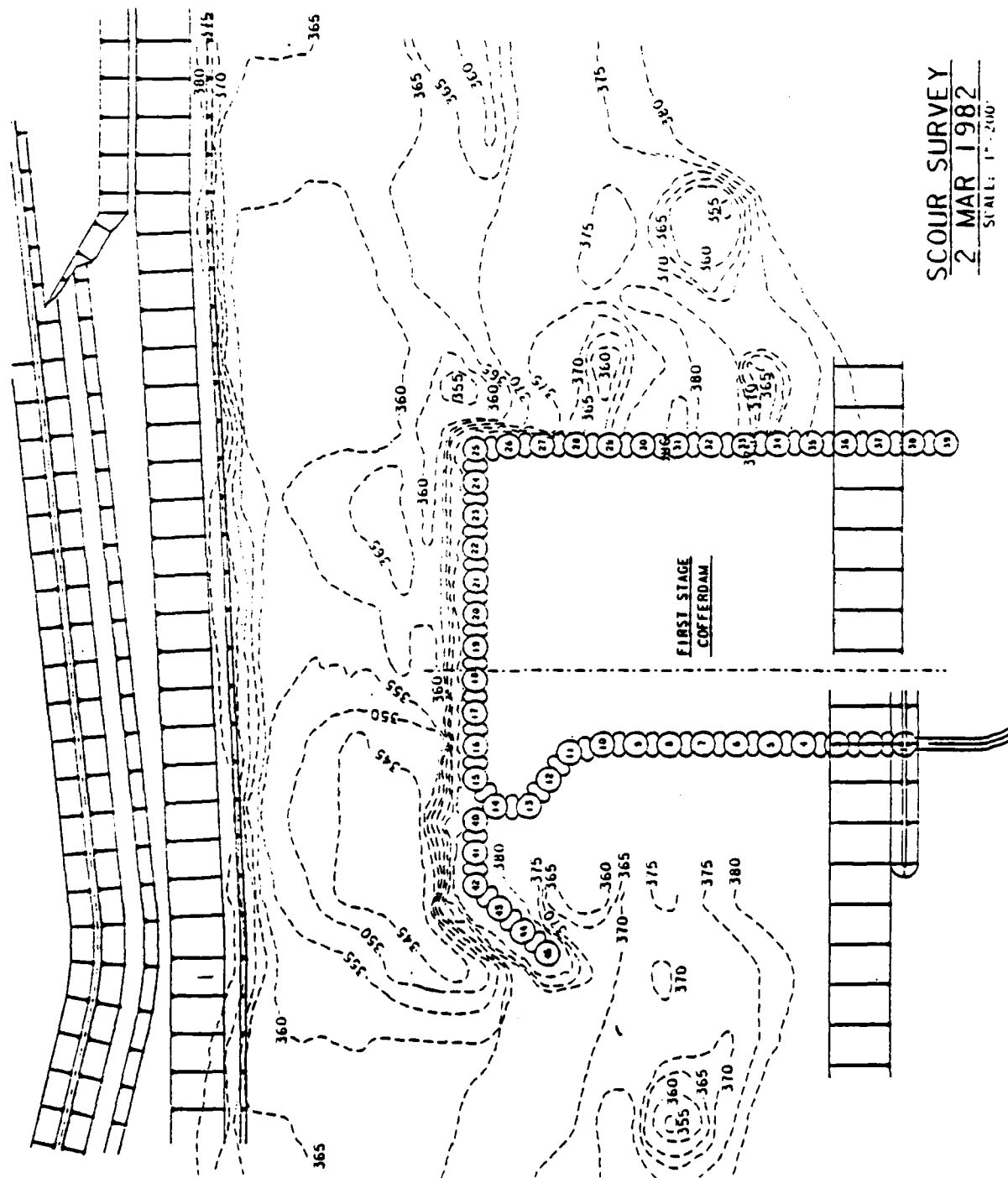


Figure 3.14. Measured contour lines (2 March 1982).

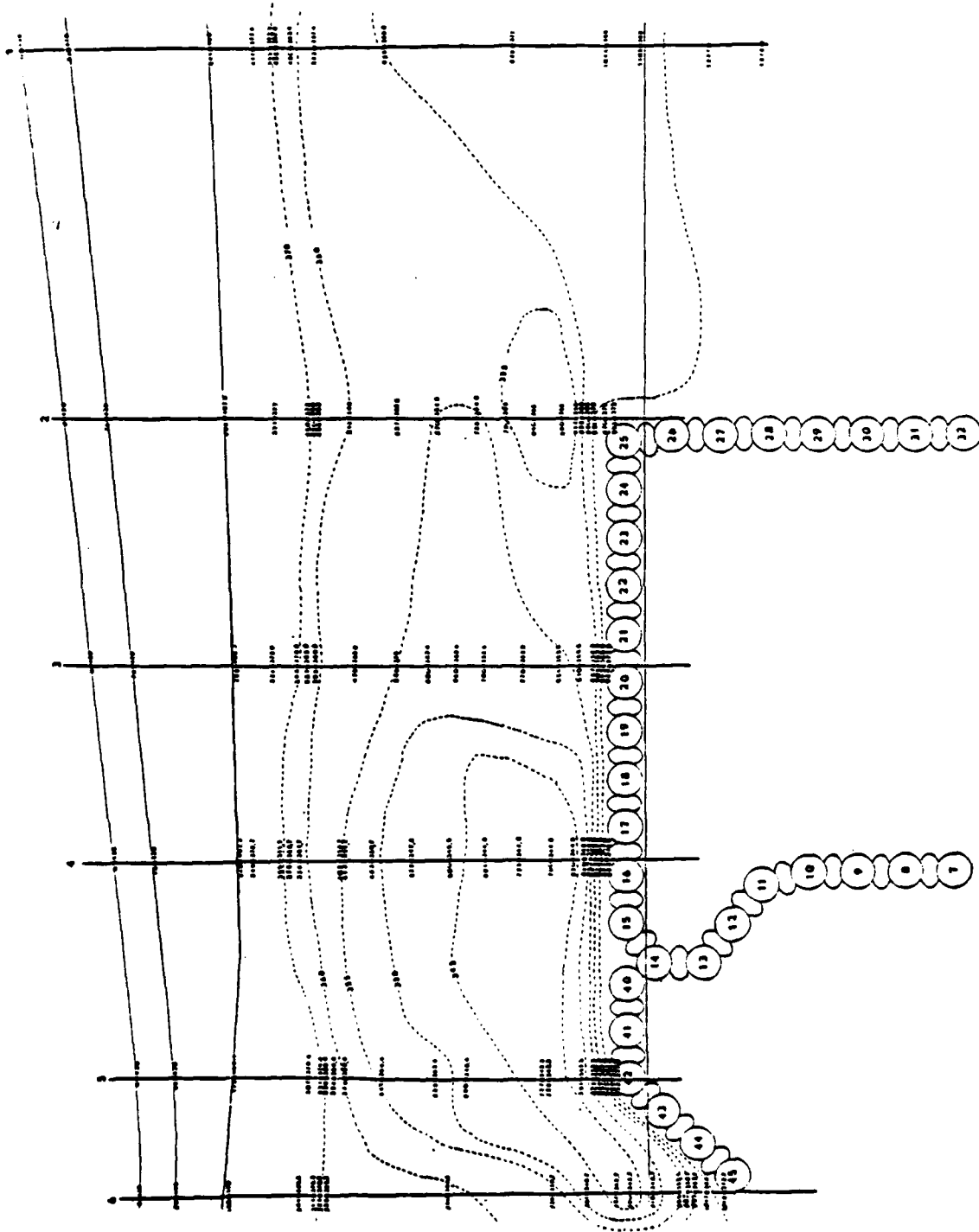


Figure 3.15. Computed contour lines (2 March 1982).

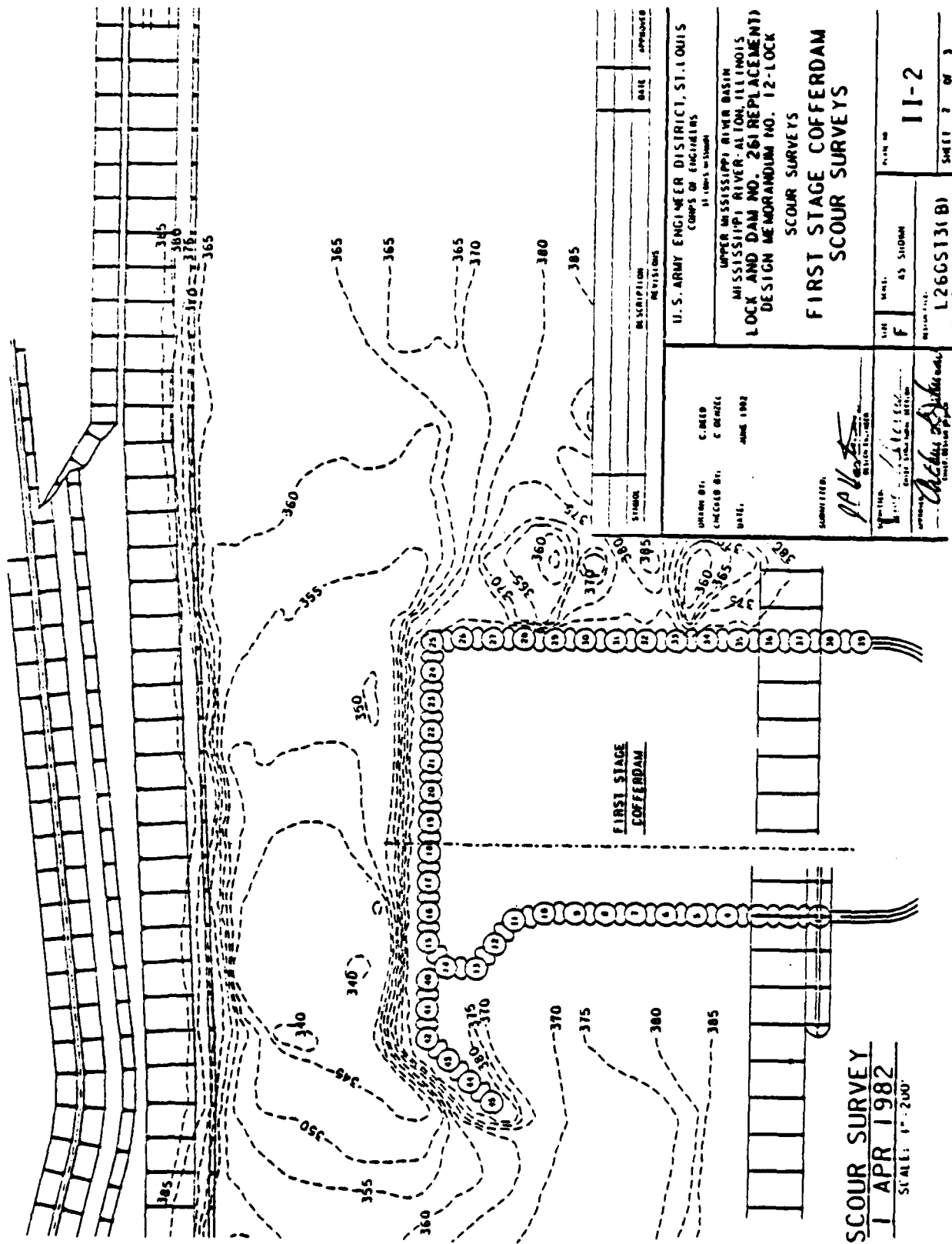


Figure 3.16. Measured contour lines (1 April 1982).

Figure 3.17. Computed contour lines at Time Step 64.

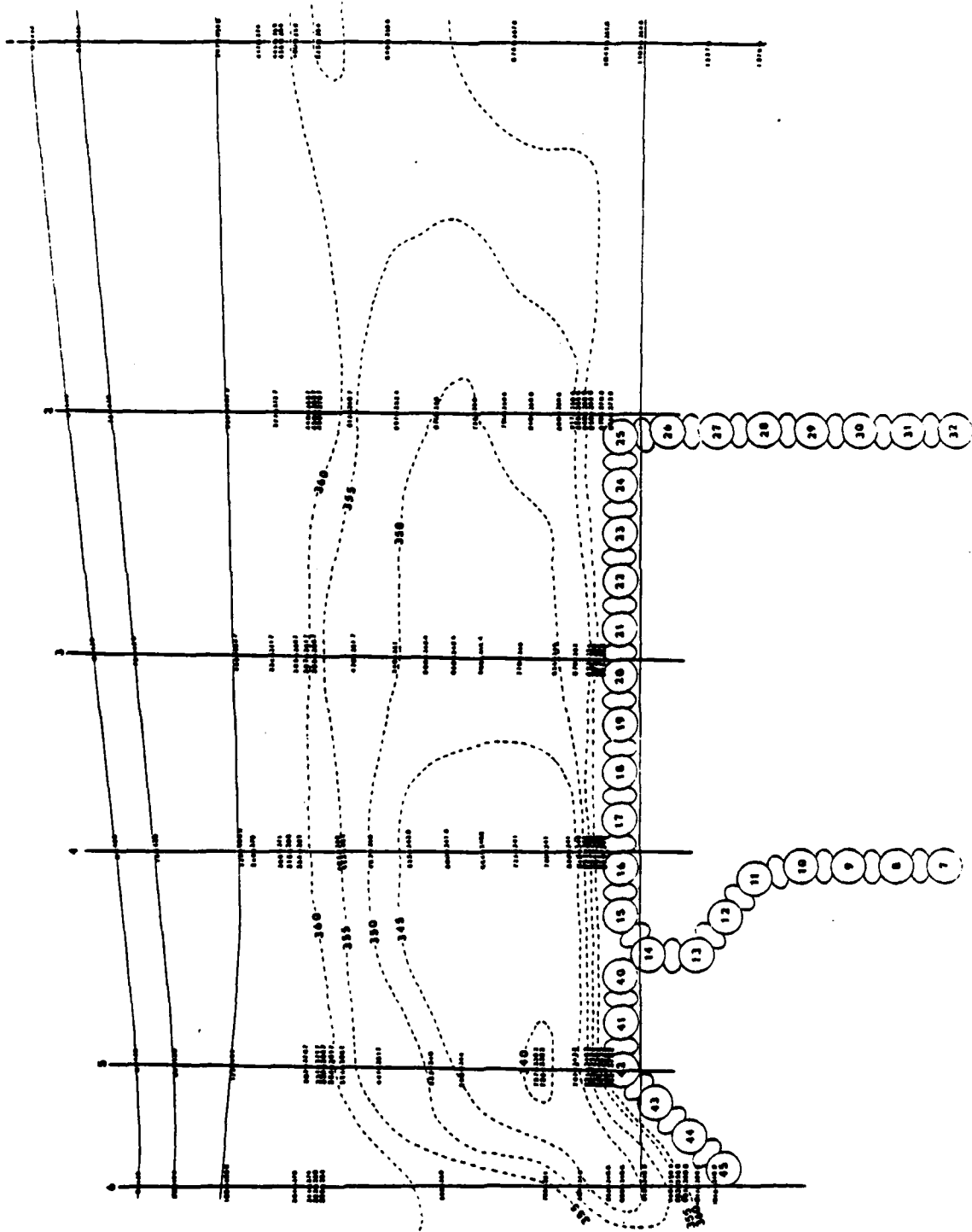


Figure 3.18. Computed contour lines (1 April 1982).

Channel cross sections for these dates correspond to days 12, 40 and 72 in the Figures 3.4 through 3.10 and Tables 3.4 through 3.9.

After various numerical experiments it was found that assuming the 3-10 mm size group as the dominant sediment size achieved the closest agreement. The closeness between measured and computed contour lines confirms the validity of such an assumption.

IV. Stage II Cofferdam Study

4.1 Development of the Data Set for Stage II Cofferdam

This section presents the data set to be used in conjunction with the Streamtube Computer Model to determine the hydraulic and sediment transport conditions for the Stage II cofferdam design Fig. 4.1. The source of the reduced hydraulic and hydrographic data was U.S. Corps of Engineers, St. Louis District. These documents were:

- a. Design Memorandums for Stage II Cofferdam
- b. Most recent hydrographic survey maps of the river reach being studied.
- c. Preliminary unpublished model data for second stage cofferdam
- d. Typical Average Hydrograph for 1965-1981

The basic data set consists of two groups, namely of stage-discharge and channel cross section data.

4.1.1 Stage-Discharge Data

The typical average hydrograph for 1965-1981 to be used for Stage II cofferdam study is presented in Table 4.1 and plotted in Fig. 4.2. This typical hydrograph was used in the physical model tests conducted at Waterways Experiment Station, U.S. Corps of Engineers. It consists of discretized discharges of different durations. Table 4.1 gives the discharges for different flow numbers, their duration, and the corresponding downstream water surface elevations used in the physical model study for each flow in prototype scales. These stage-discharge values will be used as downstream boundary conditions for hydraulic computations.

4.1.2 Channel Cross Section Data

The location of channel cross sections used in Stage II cofferdam study, and the starting riverbed topography to be used as initial

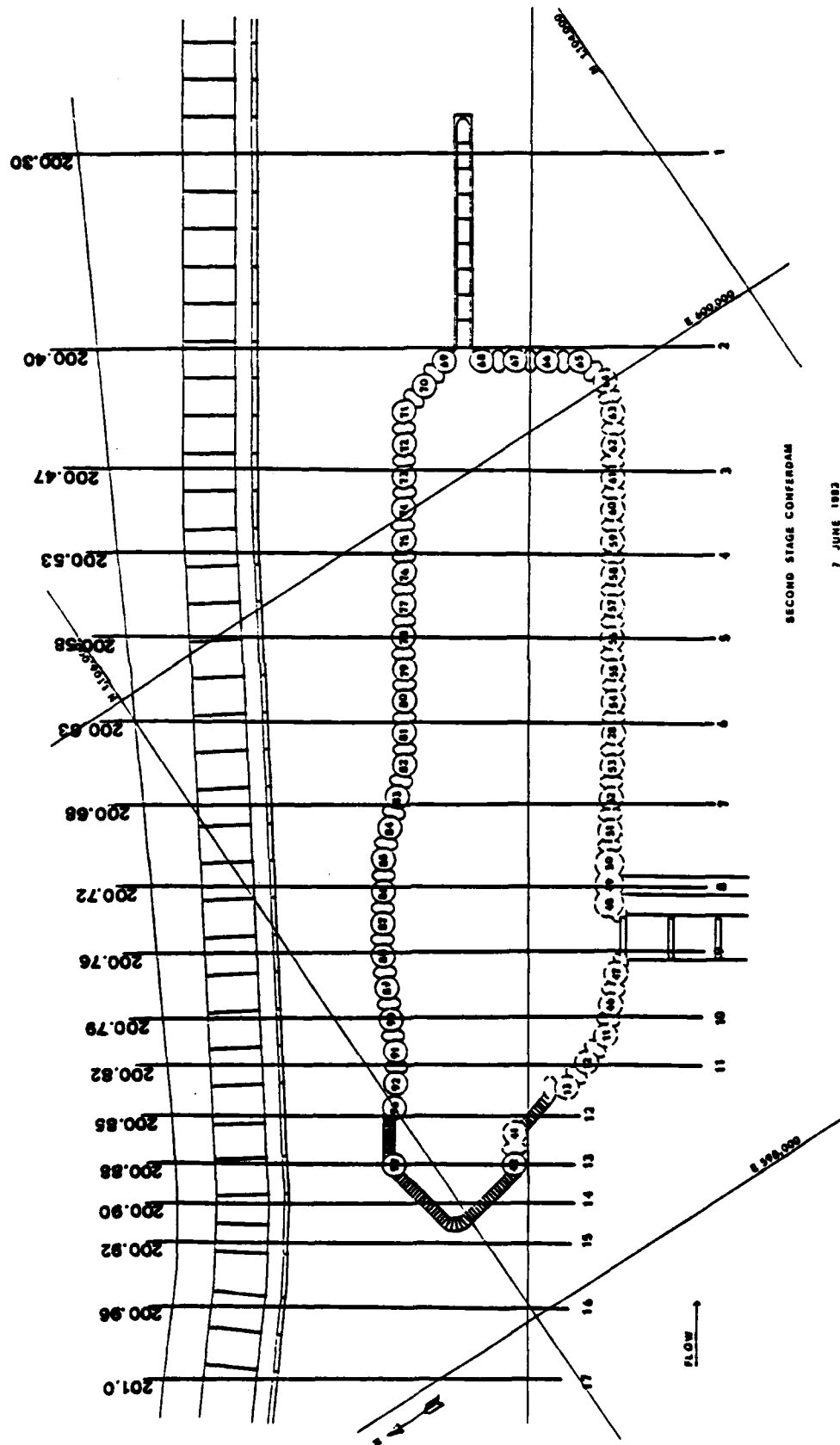


Figure 4.1. General layout of cross sections used for Stage II Cofferdam.

TABLE 4.1 Typical Average Hydrograph for 1965-1981 used in Phase II Cofferdam, Lock & Dam No. 26 (replacement) Study.

Flow No.	Discharge (CFS)	Downstream Control Elevation at RM 199.3 (FT)	Flow Duration (DAYS)
1	68,000	400.5	9
2	60,000	399.8	14
3	76,000	401.0	8
4	90,000	402.0	8
5	82,000	401.2	15
6	98,000	402.7	7
7	88,000	402.0	8
8	114,000	403.8	10
9	150,000	406.3	13
10	214,000	411.0	15
11	240,000	412.7	10
12	265,000	414.5	10
13	245,000	413.0	17
14	185,000	408.8	15
15	150,000	406.3	24
16	100,000	402.6	13
17	80,000	406.2	32
18	66,000	400.2	33
19	78,000	401.2	8
20	94,000	402.2	10
21	82,000	401.3	8
22	88,000	402.0	7
23	75,000	400.9	13

Table 4.1. Continued.

Flow No.	Discharge (CFS)	Downstream Control Elevation at RM 199.3 (FT)	Flow Duration (DAYS)
24	90,000	402.0	8
25	72,000	400.6	33
26	75,000	400.9	18

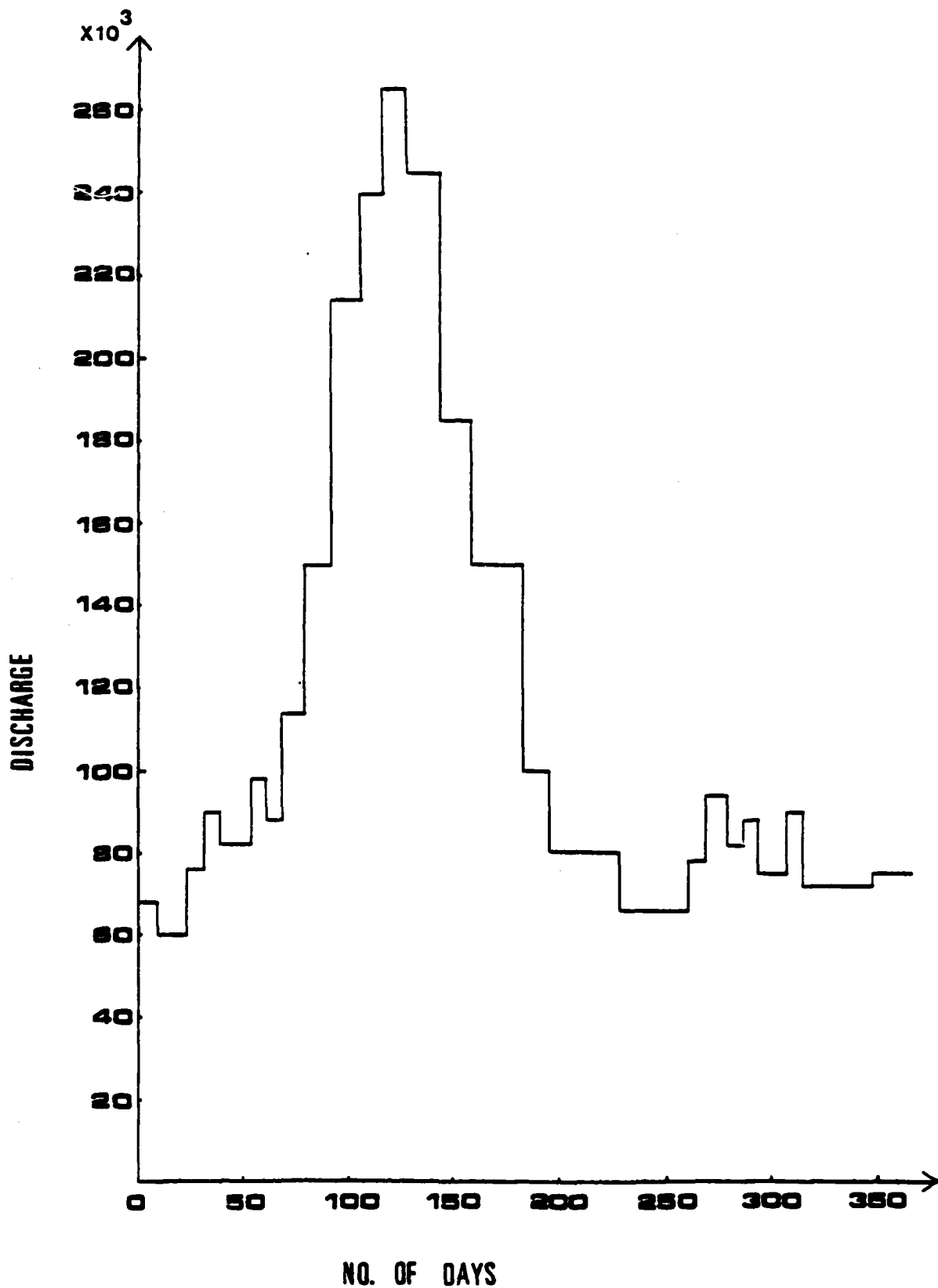


Figure 4.2. Typical average hydrograph for 1965-1981 used in Stage II Cofferdam study.

conditions for the water and sediment routing program are presented in Figs. 4.1 and 4.3. Figure 4.1 shows the general location of 17 of the 19 cross sections used in the study. These cross sections are closely spaced along the study reach. Assuming the May 7, 1983 cross sections as initial cross sections, the location of Stage II cofferdam structure was indicated in Fig. 4.4 at different stations along the study reach. These channel cross sections are tabulated in Table 4.2.

4.2 Application of Streamtube Computer Model to Stage II Cofferdam

In this section, the data set developed in Section 4.1 for the Streamtube Computer Model will be used to predict the amounts and pattern of the scouring activity at the Stage II Cofferdam site. A time step of 6 days was used in hydraulic and sediment transport computations to simulate flows for the typical average hydrograph given in Fig. 4.2,

In the following tables and figures the channel cross sections are identified by their distance to the furthest station in the downstream direction (at River Mile 199.3), in fact.

4.2.1 Water Surface Profile Computations

The stage-discharge values given in Table 4.1 were used to obtain the downstream boundary conditions for water surface profile computations. The stages, and the corresponding discharges at every sixth day were used as an input table. Due to practical reasons, a uniform channel roughness throughout the study reach with a Manning's roughness coefficient of 0.030 was assumed. Figure 4.5 presents the actual and approximated average discharge hydrograph for 1965-1981 used for Stage II Cofferdam study.

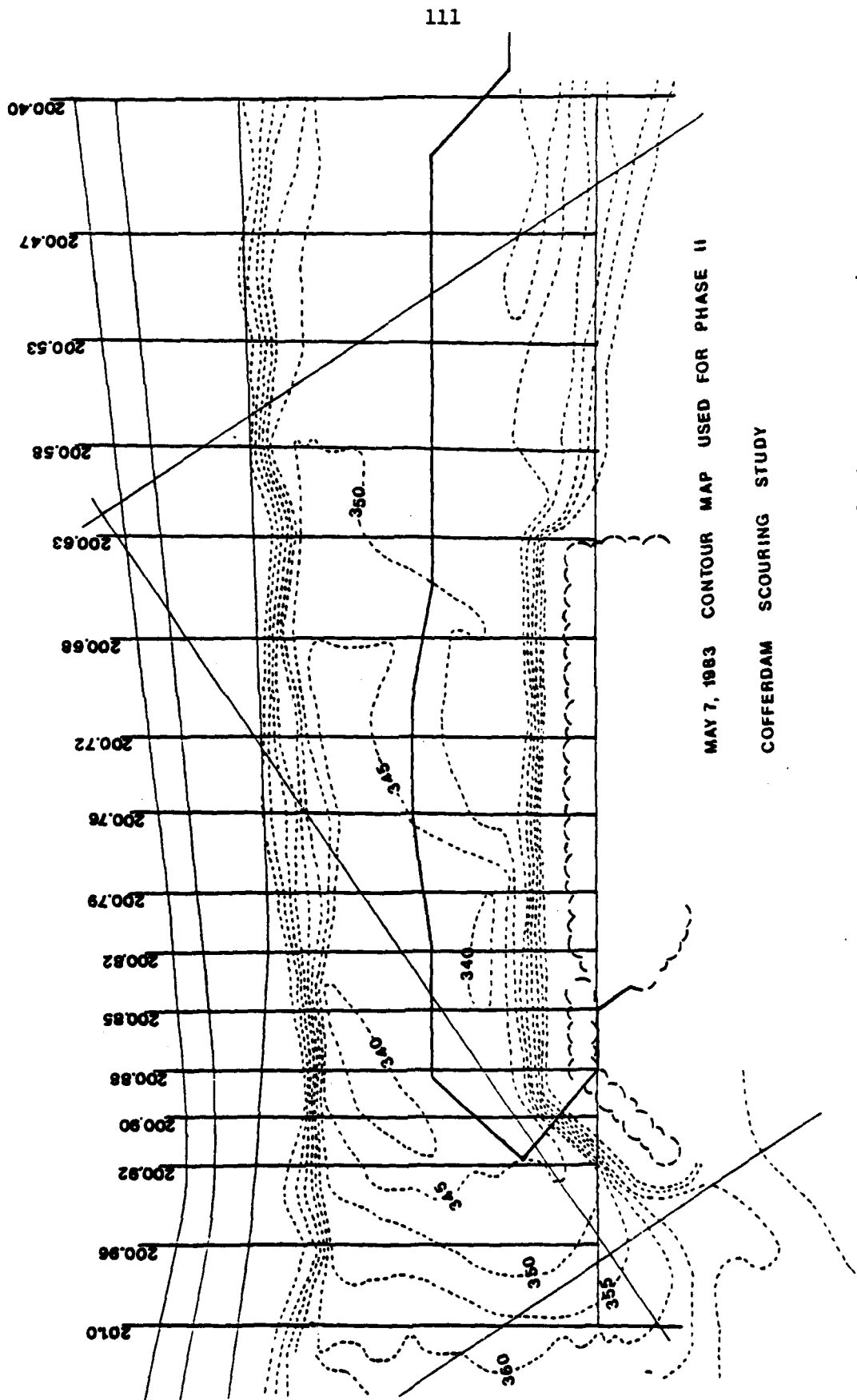


Figure 4.3. May 7, 1983 contour map used for Phase II Cofferdam scouring study.

Table 4.2. Channel cross section for Stage II Cofferdam.

POINTS PLOTTED FOR GRAPH, 1A				83/08/16			
INDEX	HOR. DIST	ELEVATION	CHANNEL CROSS SECTION FOR PHASE II COFFERDAM INDEX HOR. DIST ELEVATION	RN 299.05 INDEX	HOR. DIST	ELEVATION	
(1)	0	430.00	(6) 530.00 494.00	(11)	871.00	368.00	
(2)	80.000	420.00	(7) 521.00 386.00	(12)	938.00	370.00	
(3)	270.00	410.00	(8) 438.00 382.00	(13)	1023.0	371.00	
(4)	350.00	400.00	(9) 718.00 383.00	(14)	1106.0	373.00	
(5)	400.00	400.00	(10) 803.00 300.00	(15)	1182.0	374.00	
				(16)	1258.0		
MAP A OUTPUT				83/08/16			
POINTS PLOTTED FOR GRAPH, 1A				83/08/16			
INDEX	HOR. DIST	ELEVATION	CHANNEL CROSS SECTION FOR PHASE II COFFERDAM INDEX HOR. DIST ELEVATION	RN 299.30 INDEX	HOR. DIST	ELEVATION	
(1)	0	430.00	(6) 484.00 392.00	(11)	727.00	362.00	
(2)	80.000	420.00	(7) 456.00 386.00	(12)	788.00	364.00	
(3)	270.00	410.00	(8) 515.00 381.00	(13)	848.00	368.00	
(4)	350.00	400.00	(9) 575.00 371.00	(14)	894.00	369.00	
(5)	400.00	400.00	(10) 627.00 360.00	(15)	970.00	371.00	
				(16)	1015.0	374.00	
MAP A OUTPUT				83/08/16			
POINTS PLOTTED FOR GRAPH, 1A				83/08/16			
INDEX	HOR. DIST	ELEVATION	CHANNEL CROSS SECTION FOR PHASE II COFFERDAM INDEX HOR. DIST ELEVATION	RN 299.40 INDEX	HOR. DIST	ELEVATION	
(1)	0	430.00	(5) 417.00 376.00	(9)	531.00	355.00	
(2)	80.000	420.00	(6) 443.00 370.00	(10)	614.00	352.50	
(3)	266.00	410.00	(7) 474.00 365.00	(11)	717.00	354.50	
(4)	374.00	380.00	(8) 512.00 300.00	(12)	823.00	356.00	
				(13)	902.00	355.20	
MAP A OUTPUT				83/08/16			
POINTS PLOTTED FOR GRAPH, 1A				83/08/16			
INDEX	HOR. DIST	ELEVATION	CHANNEL CROSS SECTION FOR PHASE II COFFERDAM INDEX HOR. DIST ELEVATION	RN 299.47 INDEX	HOR. DIST	ELEVATION	
(1)	0	430.00	(9) 478.00 355.00	(17)	850.00	351.00	
(2)	80.000	420.00	(10) 500.00 350.00	(18)	900.00	351.00	
(3)	337.00	410.00	(11) 550.00 354.00	(19)	945.00	350.00	
(4)	341.00	390.00	(12) 600.00 354.00	(20)	1000.0	350.00	
(5)	361.00	370.00	(13) 650.00 353.00	(21)	1043.0	350.00	
(6)	373.00	360.00	(14) 700.00 353.00	(22)	1090.0	350.00	
(7)	388.00	340.00	(15) 750.00 352.00	(23)	1133.0	350.00	
(8)	410.00	300.00	(16) 800.00 352.00	(24)	1165.0	370.00	
				(25)	1204.0	375.00	

Table 4.2. Continued.

POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM					POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION			
(1)	0.	430.00	(6)	355.00	370.00	(1)	0.	430.00	(11)	550.00	353.00			
(2)	87.000	420.00	(7)	374.00	365.00	(2)	87.000	420.00	(12)	602.00	361.00			
(3)	319.00	410.00	(8)	306.00	360.00	(3)	319.00	410.00	(13)	650.00	355.00			
(4)	335.00	380.00	(9)	447.00	355.00	(4)	335.00	380.00	(14)	700.00	353.00			
(5)	350.00	375.00	(10)	500.00	354.00	(5)	350.00	375.00	(15)	728.00	353.00			
N A P A O U T P U T					N A P A O U T P U T					N A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM					POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM					POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION			
(1)	0.	430.00	(6)	331.00	365.00	(1)	0.	430.00	(11)	500.00	350.00			
(2)	83.000	420.00	(7)	330.00	360.00	(2)	83.000	420.00	(12)	550.00	350.00			
(3)	315.00	380.00	(8)	346.00	355.00	(3)	315.00	380.00	(13)	600.00	351.00			
(4)	315.00	375.00	(9)	403.00	350.00	(4)	315.00	375.00	(14)	638.00	351.50			
(5)	323.00	370.00	(10)	457.00	350.00	(5)	323.00	370.00	(15)	650.00	352.00			
N A P A O U T P U T					N A P A O U T P U T					N A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM					POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM					POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION			
(1)	0.	430.00	(6)	300.00	355.00	(1)	0.	430.00	(17)	750.00	353.00			
(2)	78.000	420.00	(10)	302.00	350.00	(2)	78.000	420.00	(18)	800.00	354.00			
(3)	286.00	410.00	(11)	450.00	349.00	(3)	286.00	410.00	(19)	850.00	354.00			
(4)	325.00	380.00	(12)	500.00	340.00	(4)	325.00	380.00	(20)	875.00	355.00			
(5)	337.00	375.00	(13)	523.00	350.00	(5)	337.00	375.00	(21)	890.00	350.00			
(6)	349.00	370.00	(14)	600.00	351.00	(6)	349.00	370.00	(22)	906.00	355.00			
(7)	361.00	365.00	(15)	650.00	350.00	(7)	361.00	365.00	(23)	914.00	370.00			
(8)	373.00	360.00	(16)	700.00	352.50	(8)	373.00	360.00	(24)	918.00	375.00			
N A P A O U T P U T					N A P A O U T P U T					N A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM					POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM					POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION			
(1)	0.	430.00	(6)	303.00	370.00	(1)	0.	430.00	(11)	405.00	345.00			
(2)	78.000	420.00	(7)	317.00	365.00	(2)	78.000	420.00	(12)	450.00	345.00			
(3)	286.00	410.00	(8)	321.00	360.00	(3)	286.00	410.00	(13)	500.00	345.00			
(4)	288.00	380.00	(9)	327.00	355.00	(4)	288.00	380.00	(14)	551.00	345.00			
(5)	296.00	375.00	(10)	350.00	350.00	(5)	296.00	375.00	(15)	600.00	351.00			
N A P A O U T P U T					N A P A O U T P U T					N A P A O U T P U T				

Table 4.2. Continued.

POINTS PLOTTED FOR GRAPH, 1A.			
CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM		RM 200.72	
INDEX	HOR. DIST	INDEX	HOR. DIST
ELEVATION		ELEVATION	
(1)	0.	(17)	700.00
(2)	75.000	(18)	750.00
(3)	251.00	(19)	800.00
(4)	259.00	(20)	835.00
(5)	267.00	(21)	845.00
(6)	278.00	(22)	851.00
(7)	290.00	(23)	861.00
(8)	320.00	(24)	867.00
		(25)	871.00
			351.00
			350.00
			354.00
			355.00
			360.00
			365.00
			370.00
			375.00
			380.00

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M A P A O U T P U T

POINTS PLOTTED FOR GRAPH, 1A.			
CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM		RM 200.76	
INDEX	HOR. DIST	INDEX	HOR. DIST
ELEVATION		ELEVATION	
(1)	0.	(15)	500.00
(2)	71.000	(16)	575.00
(3)	236.00	(17)	750.00
(4)	239.00	(18)	796.00
(5)	251.00	(19)	820.00
(6)	256.00	(20)	827.00
(7)	310.00	(21)	833.00
		(22)	839.00
		(23)	847.00
			348.00
			350.00
			350.00
			355.00
			360.00
			365.00
			370.00
			375.00
			380.00

83/08/16

M A P A O U T P U T

POINTS PLOTTED FOR GRAPH, 1A.			
CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM		RM 200.79	
INDEX	HOR. DIST	INDEX	HOR. DIST
ELEVATION		ELEVATION	
(1)	0.	(17)	706.00
(2)	71.000	(18)	714.00
(3)	224.00	(19)	753.00
(4)	247.00	(20)	769.00
(5)	253.00	(21)	796.00
(6)	275.00	(22)	804.00
(7)	288.00	(23)	810.00
(8)	314.00	(24)	818.00
		(25)	824.00
		(26)	833.00
			340.00
			340.00
			345.00
			350.00
			355.00
			360.00
			365.00
			370.00
			375.00
			380.00

Table 4.2. Continued.

POINTS PLOTTED FOR GRAPH, 1A				
CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST
(1)	0.	430.00	(9)	314.00
(2)	67.000	420.00	(10)	355.00
(3)	208.00	410.00	(11)	350.00
(4)	251.00	390.00	(12)	345.00
(5)	253.00	380.00	(13)	341.00
(6)	275.00	370.00	(14)	340.00
(7)	282.00	365.00	(15)	343.00
(8)	290.00	360.00	(16)	341.00
MAP OUTPUT				
POINTS PLOTTED FOR GRAPH, 1A				
CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST
(1)	0.	430.00	(10)	310.00
(2)	71.000	420.00	(11)	318.00
(3)	192.00	410.00	(12)	320.00
(4)	251.00	390.00	(13)	320.00
(5)	257.00	375.00	(14)	320.00
(6)	275.00	370.00	(15)	340.00
(7)	286.00	365.00	(16)	341.00
(8)	294.00	360.00	(17)	340.00
(9)	298.00	355.00	(18)	340.00
MAP OUTPUT				
POINTS PLOTTED FOR GRAPH, 1A				
CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST
(1)	0.	430.00	(9)	290.00
(2)	71.000	420.00	(10)	306.00
(3)	173.00	410.00	(11)	314.00
(4)	257.00	380.00	(12)	317.00
(5)	275.00	375.00	(13)	340.00
(6)	278.00	370.00	(14)	340.00
(7)	286.00	365.00	(15)	340.00
(8)	294.00	360.00	(16)	341.00

POINTS PLOTTED FOR GRAPH, 1A				
CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST
(1)	0.	430.00	(9)	314.00
(2)	67.000	420.00	(10)	355.00
(3)	208.00	410.00	(11)	350.00
(4)	251.00	390.00	(12)	345.00
(5)	253.00	380.00	(13)	341.00
(6)	275.00	370.00	(14)	340.00
(7)	282.00	365.00	(15)	343.00
(8)	290.00	360.00	(16)	341.00
MAP OUTPUT				
POINTS PLOTTED FOR GRAPH, 1A				
CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST
(1)	0.	430.00	(10)	310.00
(2)	71.000	420.00	(11)	318.00
(3)	192.00	410.00	(12)	320.00
(4)	251.00	390.00	(13)	320.00
(5)	257.00	375.00	(14)	320.00
(6)	275.00	370.00	(15)	340.00
(7)	286.00	365.00	(16)	341.00
(8)	294.00	360.00	(17)	340.00
(9)	298.00	355.00	(18)	340.00
MAP OUTPUT				
POINTS PLOTTED FOR GRAPH, 1A				
CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST
(1)	0.	430.00	(9)	290.00
(2)	71.000	420.00	(10)	306.00
(3)	173.00	410.00	(11)	314.00
(4)	257.00	380.00	(12)	317.00
(5)	275.00	375.00	(13)	340.00
(6)	278.00	370.00	(14)	340.00
(7)	286.00	365.00	(15)	340.00
(8)	294.00	360.00	(16)	341.00

83/08/16

RM 290.82

INDEX

HOR. DIST

ELEVATION

ELEVATION

ELEVATION

ELEVATION

ELEVATION

83/08/16

RM 290.88

INDEX

HOR. DIST

ELEVATION

ELEVATION

ELEVATION

ELEVATION

ELEVATION

Table 4.2. Continued.

POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM					83/08/16				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0	430.00	(9)	200.00	355.00	(17)	650.00	343.00	(17)
(2)	65.000	420.00	(10)	250.00	350.00	(18)	700.00	344.00	(18)
(3)	161.00	410.00	(11)	302.00	345.00	(19)	765.00	345.00	(19)
(4)	255.00	390.00	(12)	352.00	340.00	(20)	780.00	350.00	(20)
(5)	283.00	376.00	(13)	400.00	340.00	(21)	784.00	355.00	(21)
(6)	271.00	370.00	(14)	435.00	340.00	(22)	795.00	350.00	(22)
(7)	270.00	365.00	(15)	550.00	341.00	(23)	802.00	355.00	(23)
(8)	294.00	360.00	(16)	600.00	342.00	(24)	820.00	370.00	(24)
						(25)	835.00	375.00	(25)
						(26)	851.00	380.00	(26)
MAPA OUTPUT					83/08/16				
POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM					83/08/16				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0	430.00	(10)	310.00	350.00	(19)	750.00	345.00	(19)
(2)	63.000	420.00	(11)	368.00	345.00	(20)	788.00	345.00	(20)
(3)	153.00	410.00	(12)	450.00	342.00	(21)	831.00	350.00	(21)
(4)	227.00	390.00	(13)	500.00	341.00	(22)	894.00	350.00	(22)
(5)	251.00	375.00	(14)	550.00	341.00	(23)	910.00	350.00	(23)
(6)	257.00	370.00	(15)	600.00	341.00	(24)	922.00	350.00	(24)
(7)	278.00	365.00	(16)	650.00	344.00	(25)	925.00	350.00	(25)
(8)	286.00	360.00	(17)	700.00	344.00	(26)	931.00	370.00	(26)
(9)	294.00	355.00	(18)	714.00	345.00	(27)	953.00	370.00	(27)
						(28)	973.00	380.00	(28)
MAPA OUTPUT					83/08/16				
POINTS PLOTTED FOR GRAPH, 1A, CHANNEL CROSS SECTIONS FOR PHASE II COFFERDAM					83/08/16				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0	430.00	(9)	345.00	355.00	(17)	790.00	349.00	(17)
(2)	71.000	420.00	(10)	400.00	352.50	(18)	840.00	349.00	(18)
(3)	161.00	410.00	(11)	450.00	352.00	(19)	890.00	349.00	(19)
(4)	222.00	390.00	(12)	500.00	351.00	(20)	930.00	350.00	(20)
(5)	246.00	375.00	(13)	550.00	351.00	(21)	980.00	350.00	(21)
(6)	318.00	370.00	(14)	600.00	350.00	(22)	1075.0	350.00	(22)
(7)	327.00	365.00	(15)	650.00	349.00	(23)	1118.0	355.00	(23)
(8)	359.00	360.00	(16)	700.00	348.00	(24)	1333.0	370.00	(24)
						(25)	1483.0	375.00	(25)

Table 4.2. Continued.

INDEX		CHANNEL CROSS SECTIONS FOR PHASE I ^a		POINTS PLOTTED FOR GRAPH 1A		INDEX		INDEX	
HOR. DIST		ELEVATION		INDEX		HOR. DIST		ELEVATION	
HOR. DIST		ELEVATION		INDEX		HOR. DIST		ELEVATION	
(1)	75.00	430.00	400.00	(9)	400.00	355.00	(17)	355.00	355.00
(2)	175.00	400.00	450.00	(10)	450.00	355.00	(18)	355.00	355.00
(3)	253.00	410.00	520.00	(11)	520.00	355.00	(19)	355.00	355.00
(4)	253.00	390.00	550.00	(12)	550.00	355.00	(20)	355.00	355.00
(5)	253.00	375.00	600.00	(13)	600.00	355.00	(21)	355.00	355.00
(6)	300.00	375.00	650.00	(14)	650.00	355.00	(22)	355.00	355.00
(7)	318.00	365.00	700.00	(15)	700.00	355.00	(23)	355.00	355.00
(8)	353.00	360.00	750.00	(16)	750.00	355.00	(24)	355.00	355.00

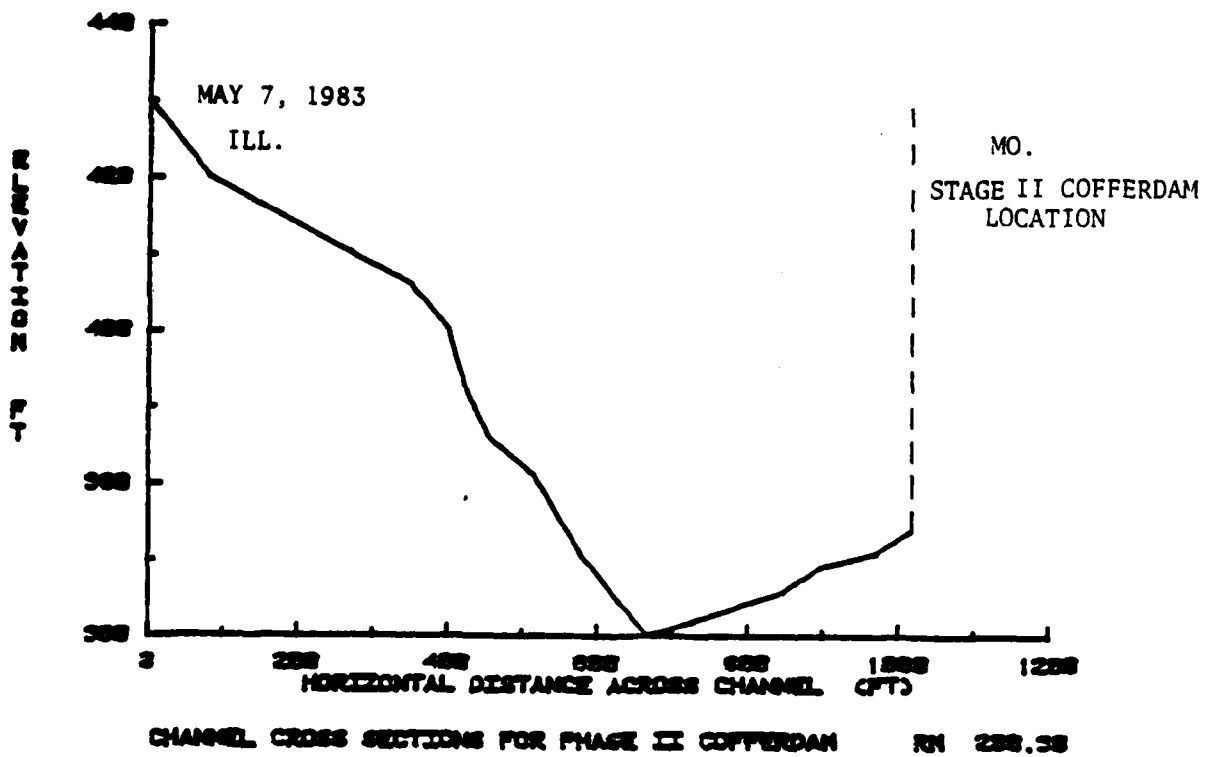
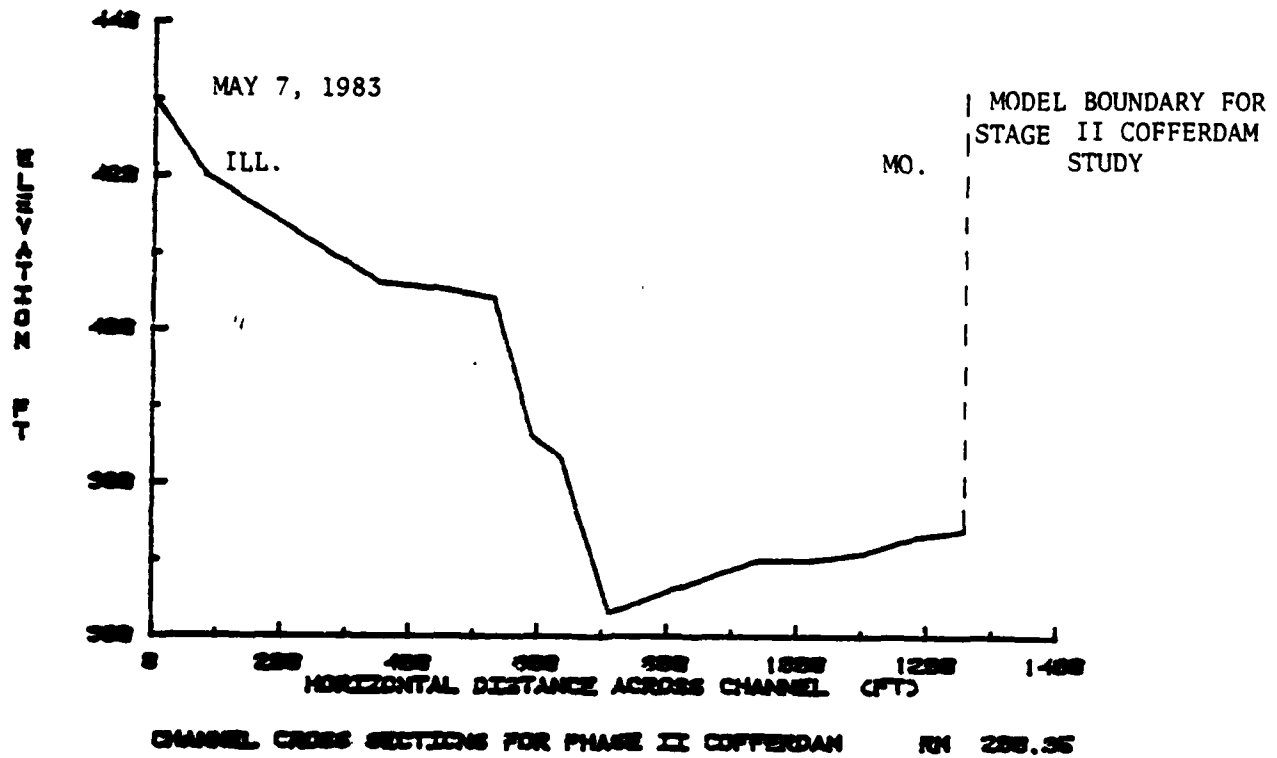


Figure 4.4. Channel cross sections for Stage II Cofferdam.

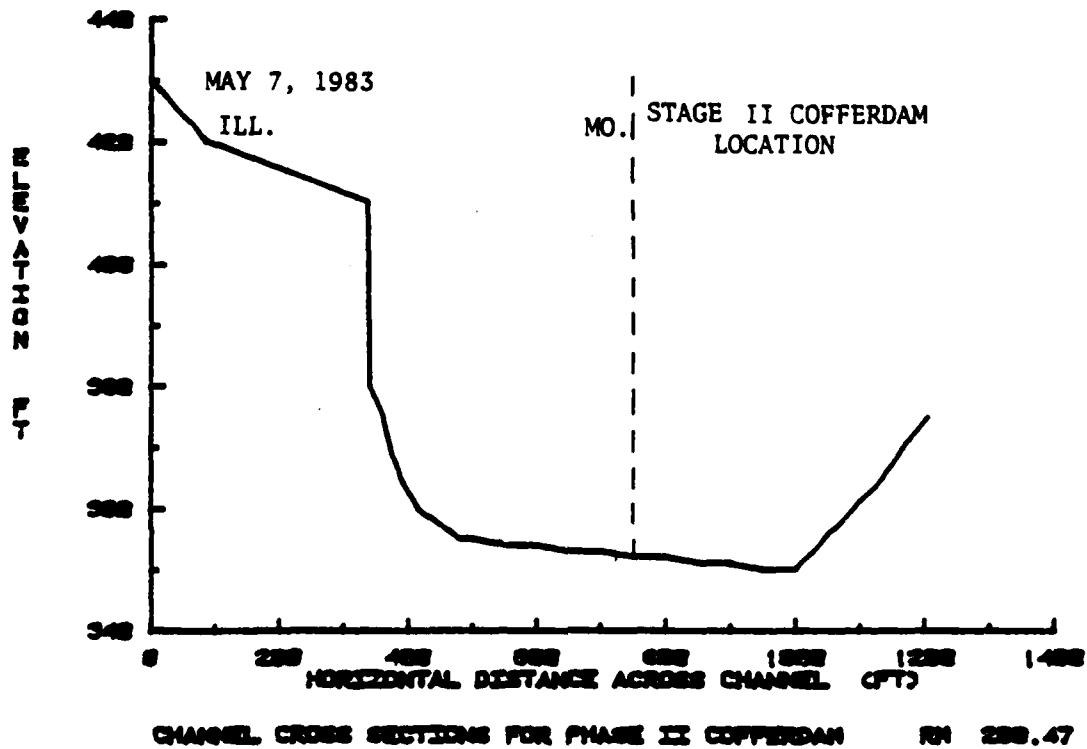
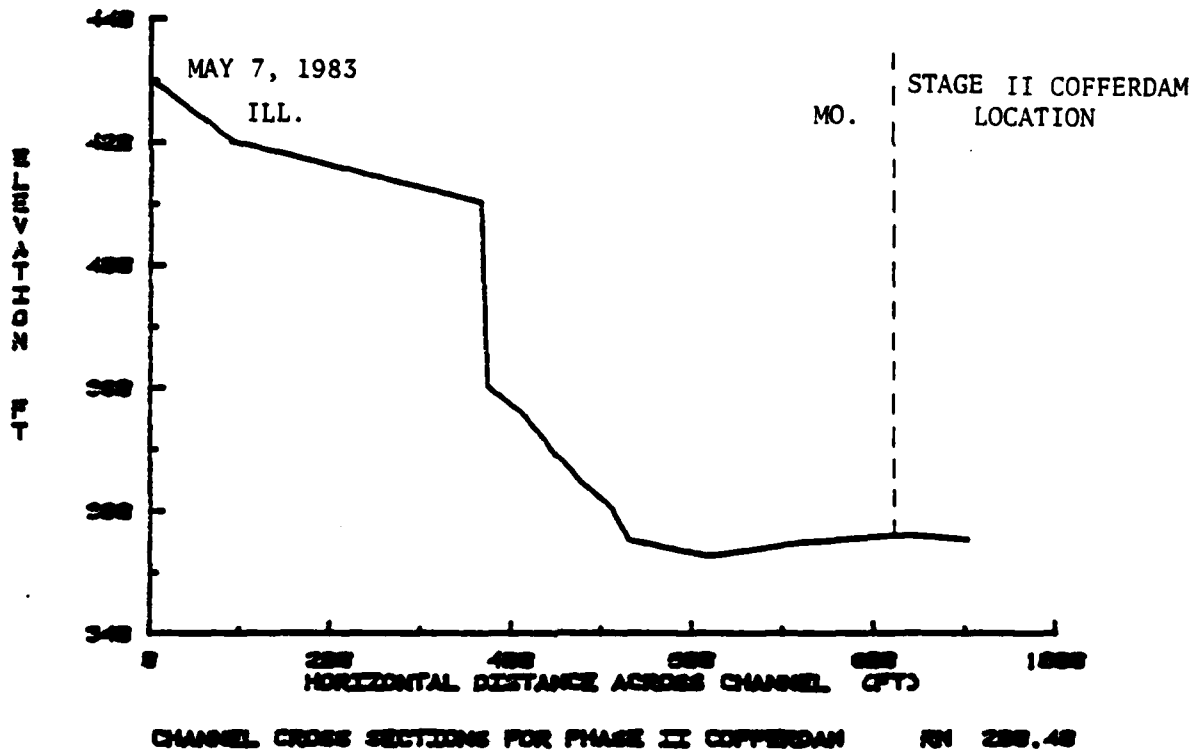


Figure 4.4. Continued.

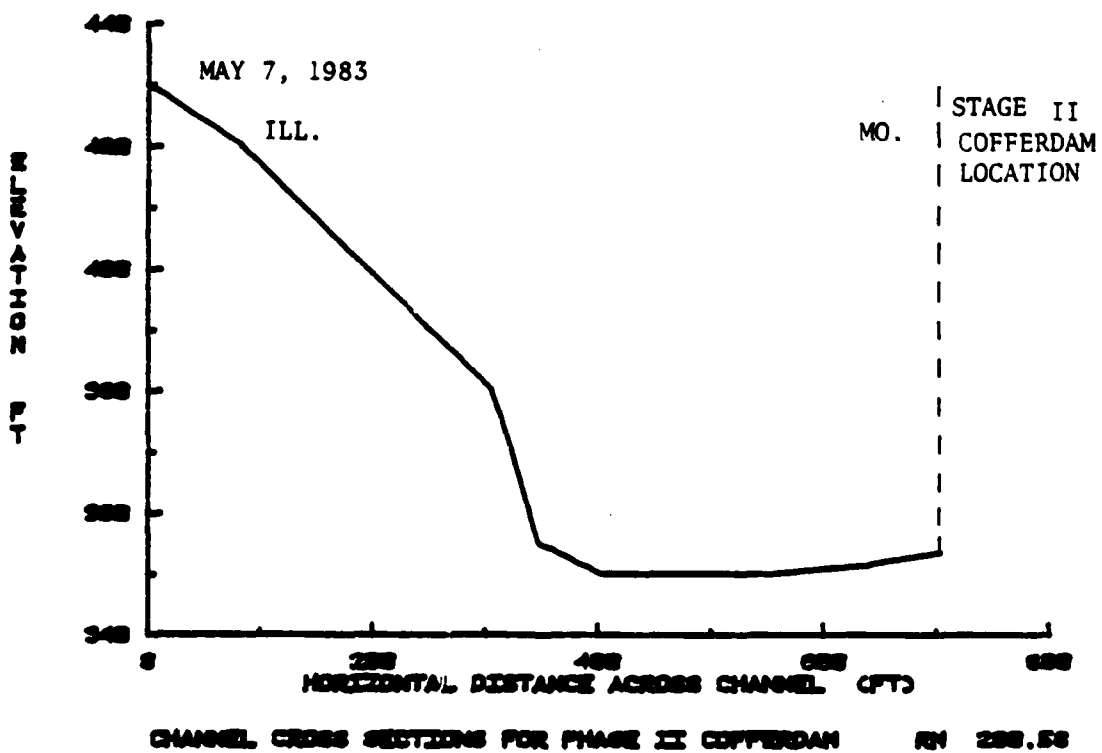
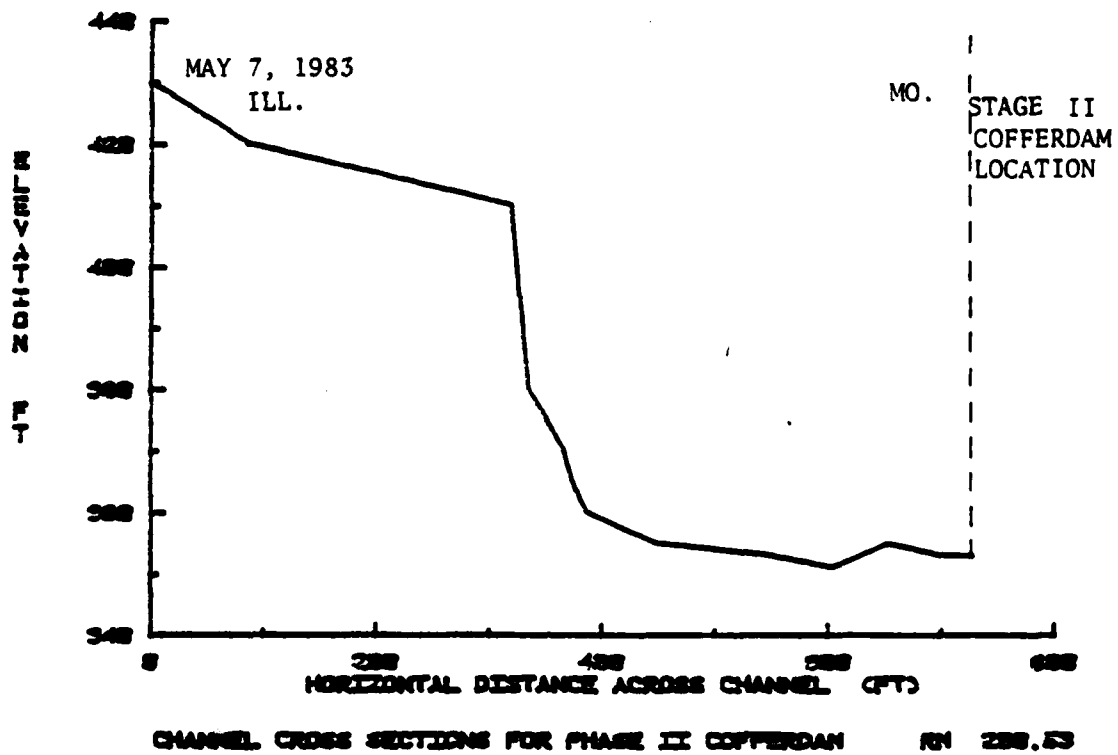


Figure 4.4. Continued.

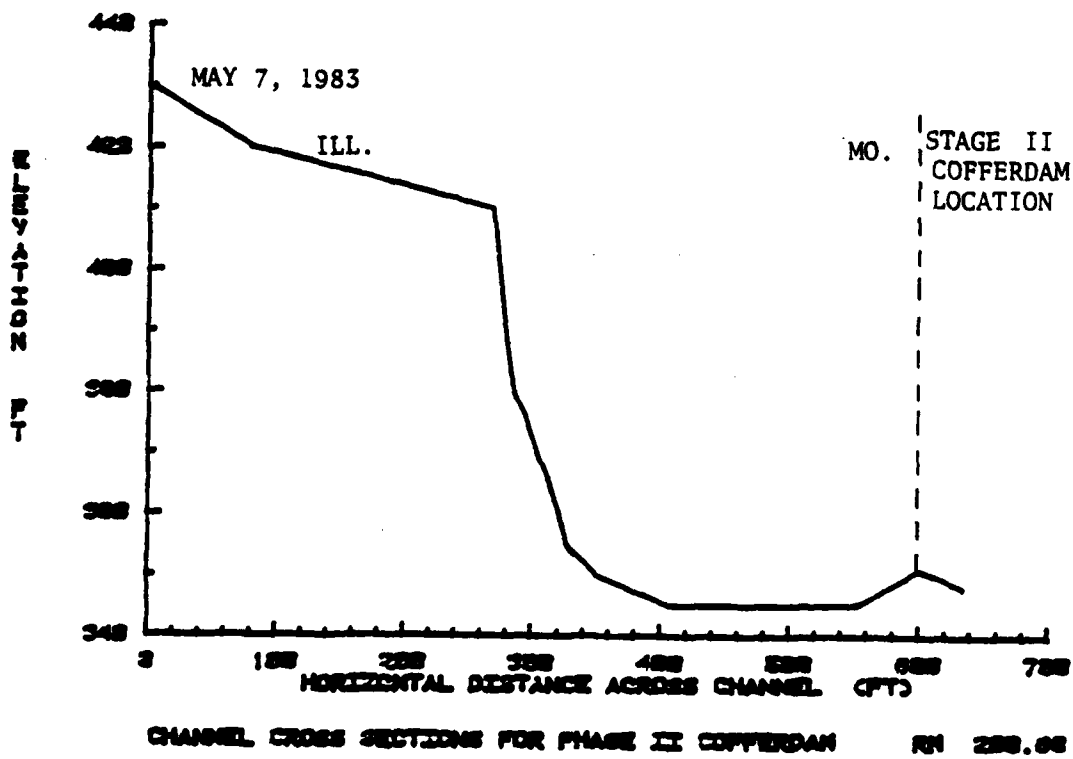
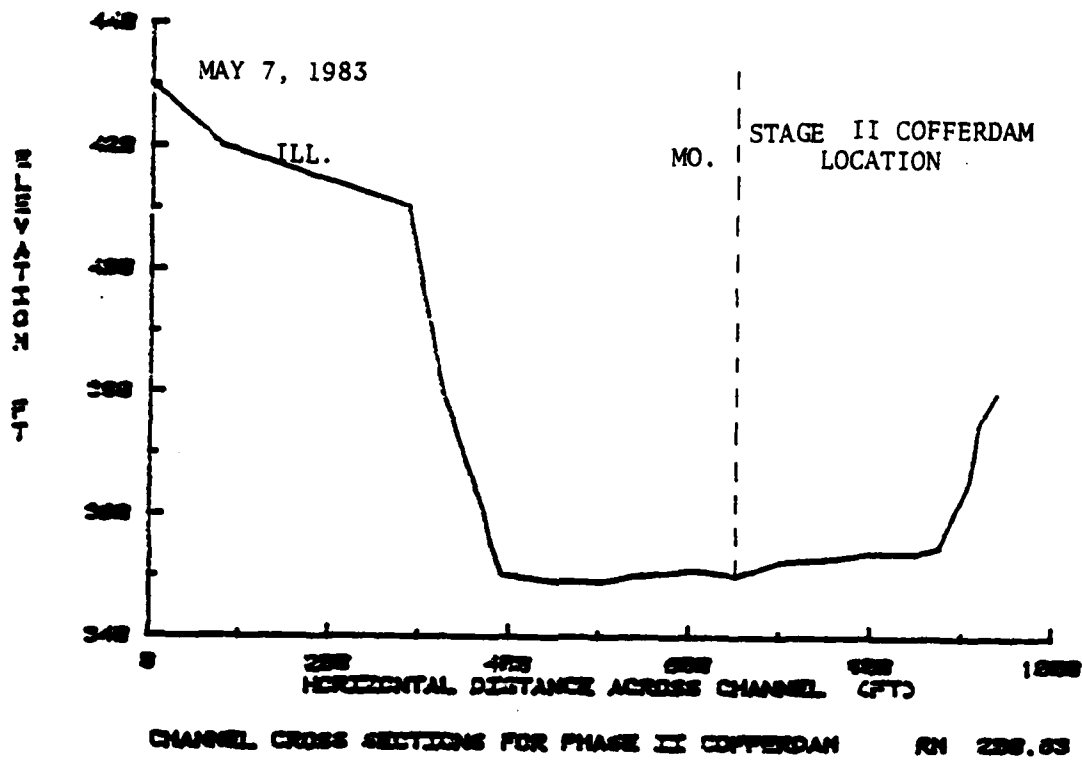


Figure 4.4. Continued.

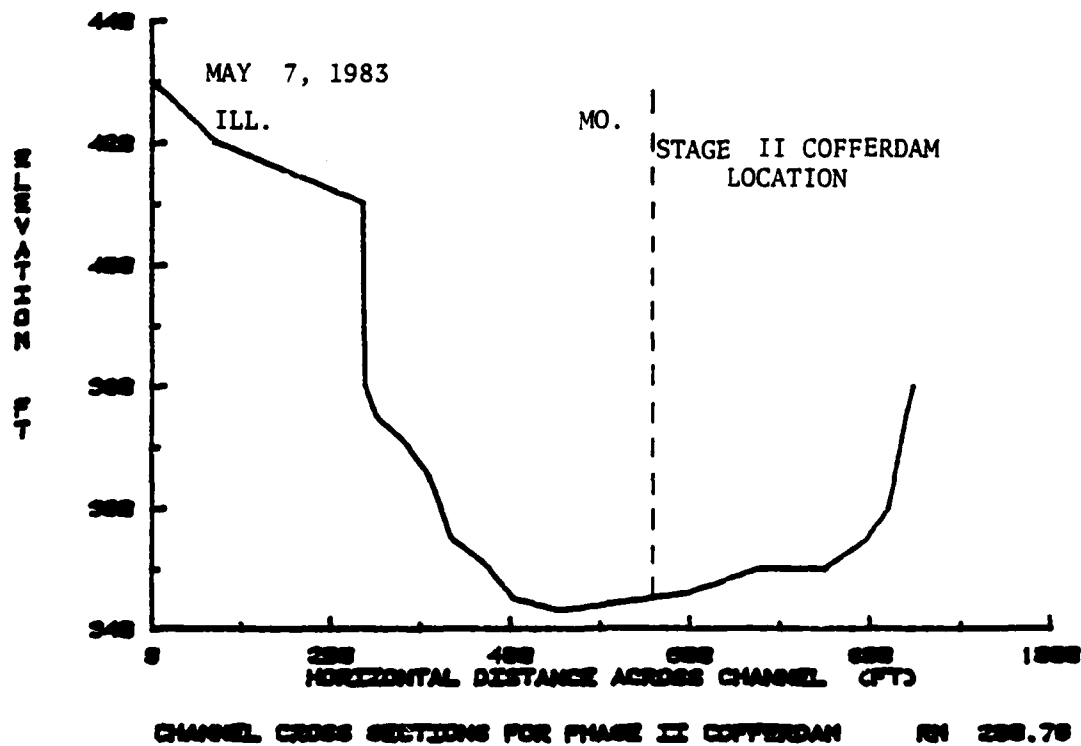
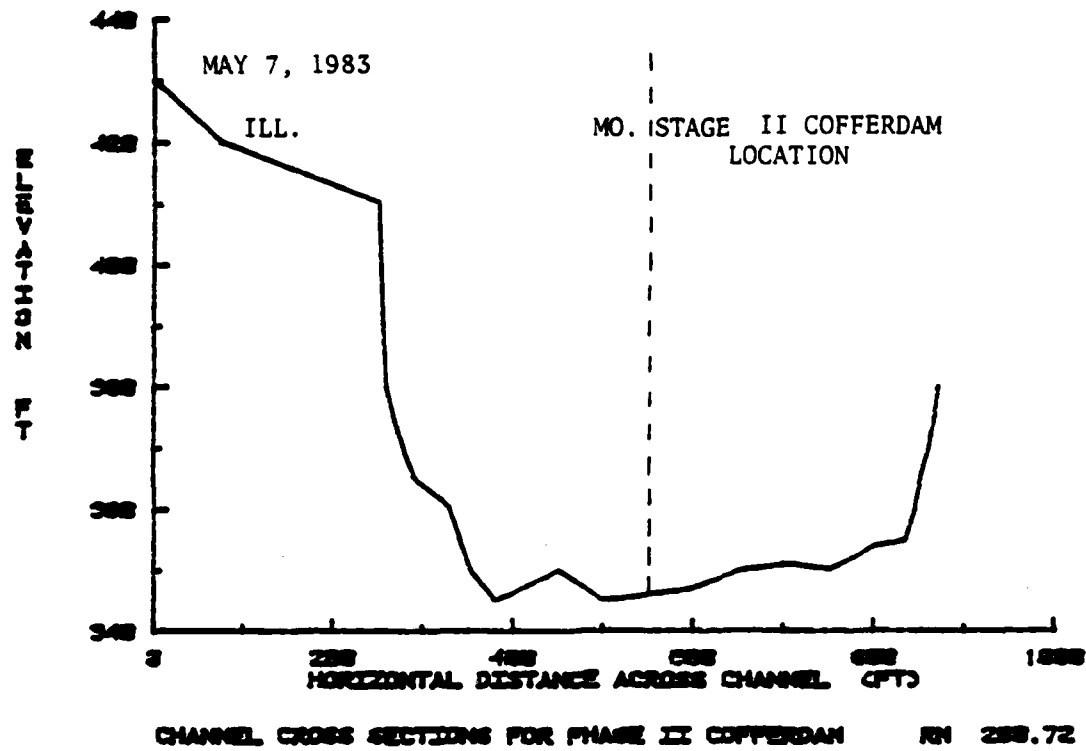


Figure 4.4. Continued.

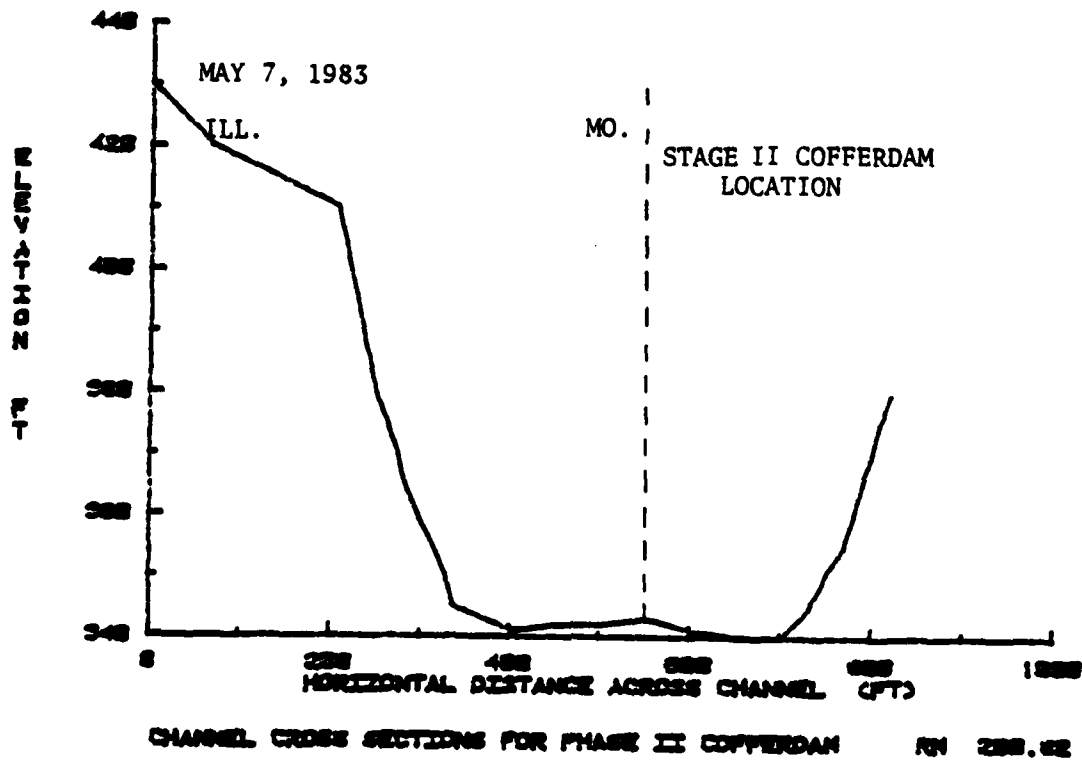
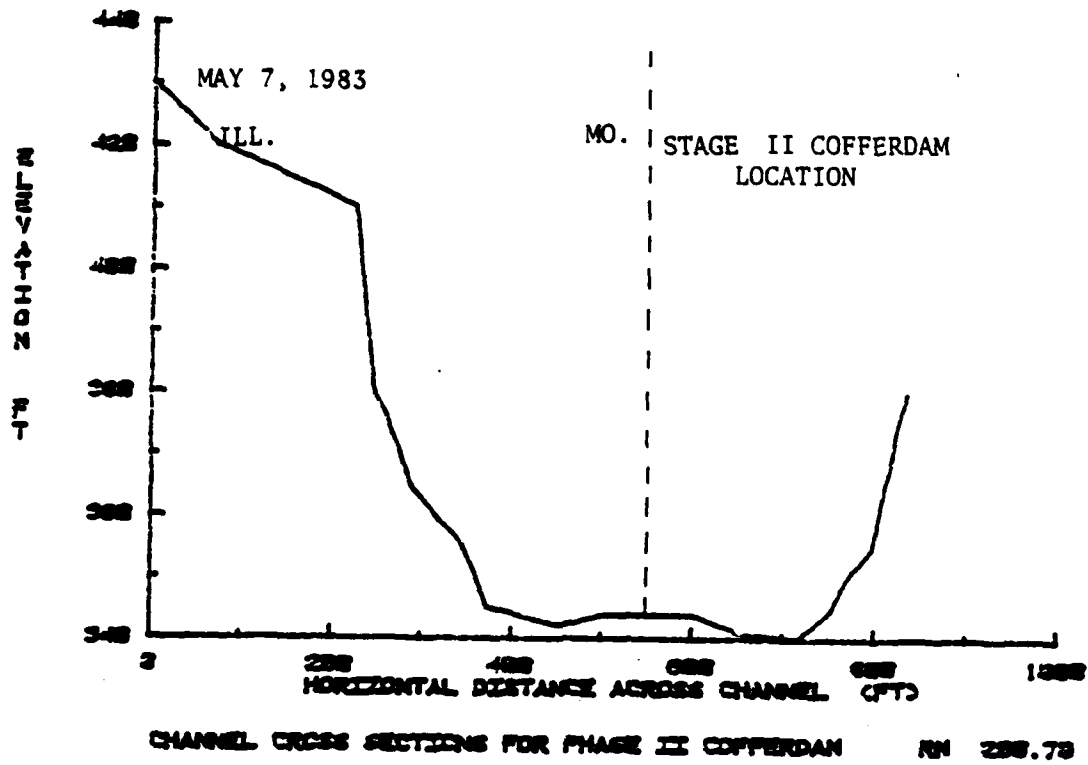


Figure 4.4. Continued.

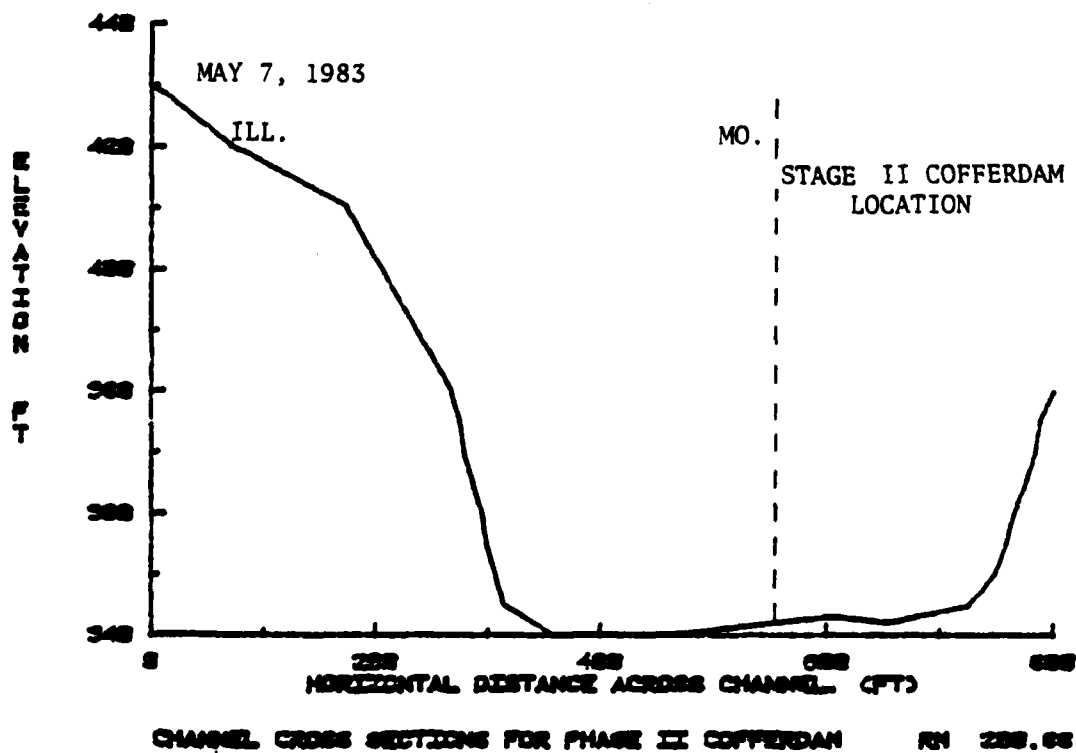
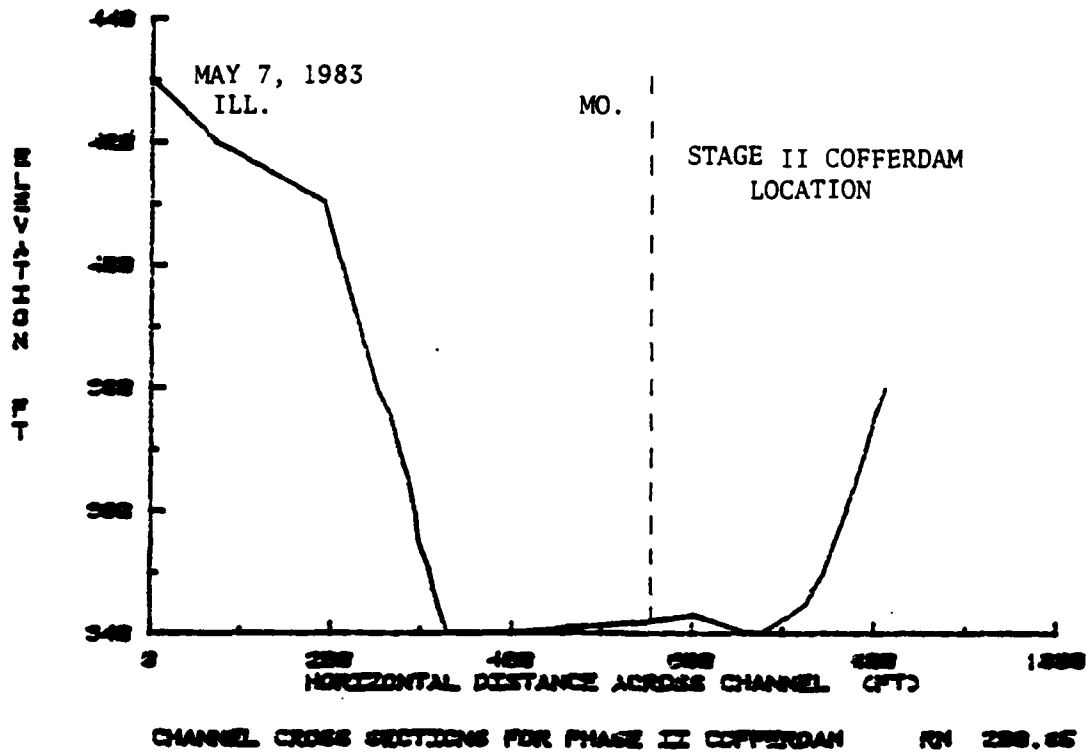


Figure 4.4. Continued.

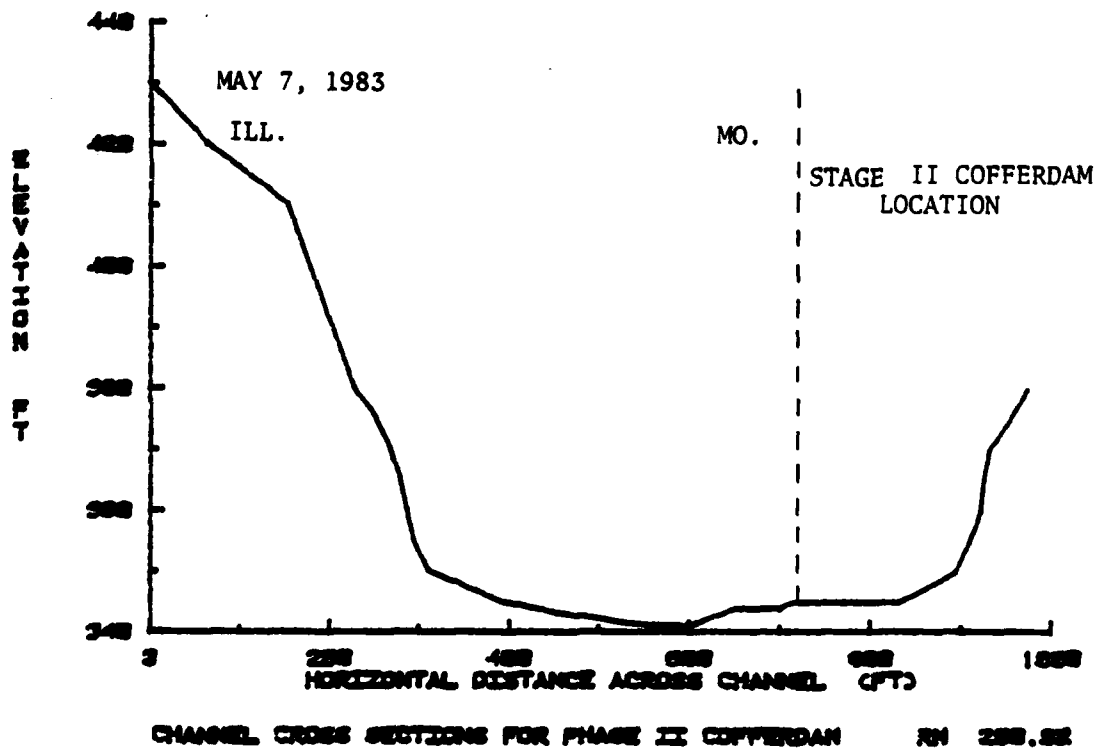
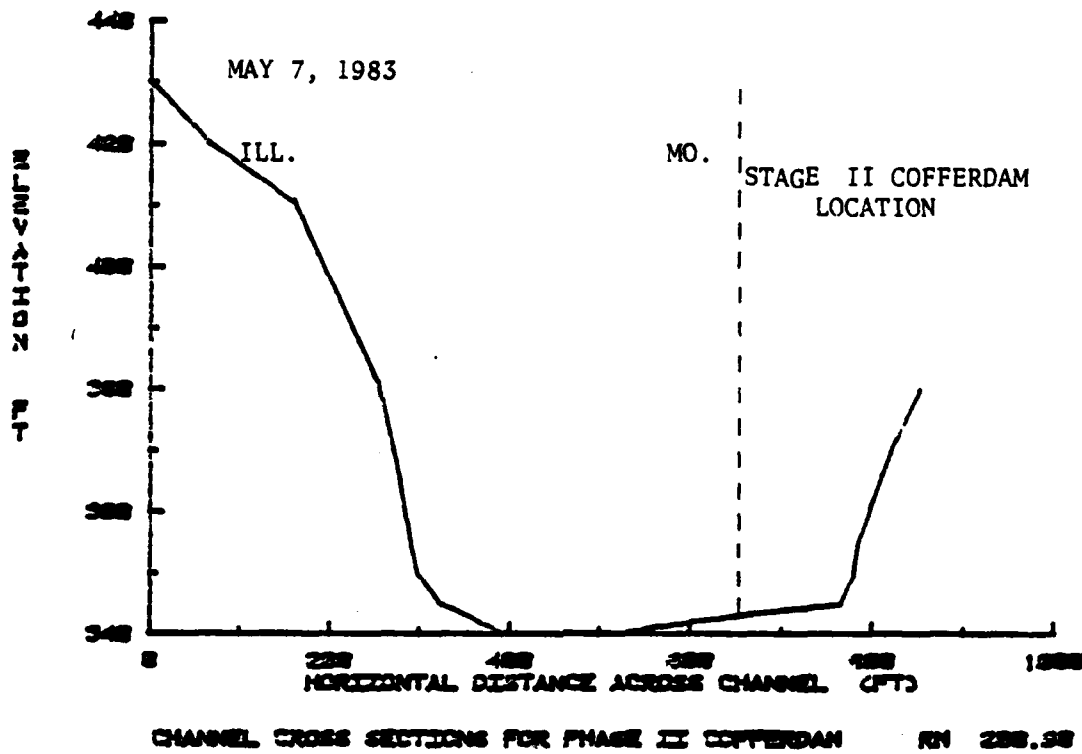


Figure 4.4. Continued.

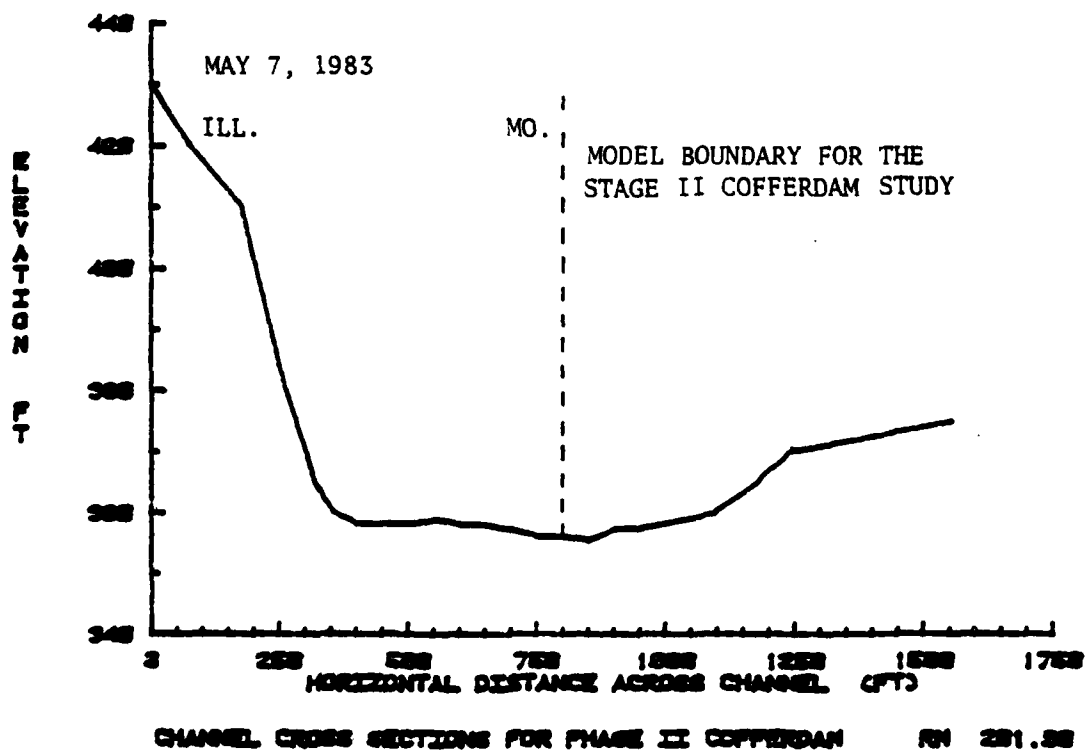
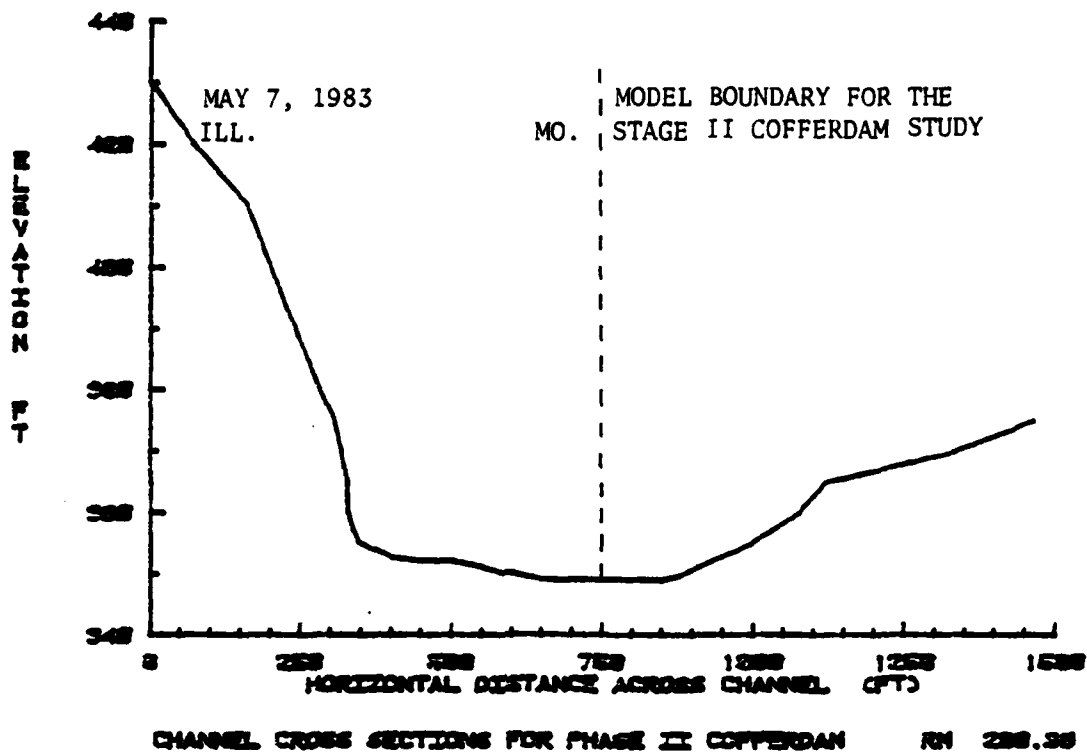


Figure 4.4. Continued.

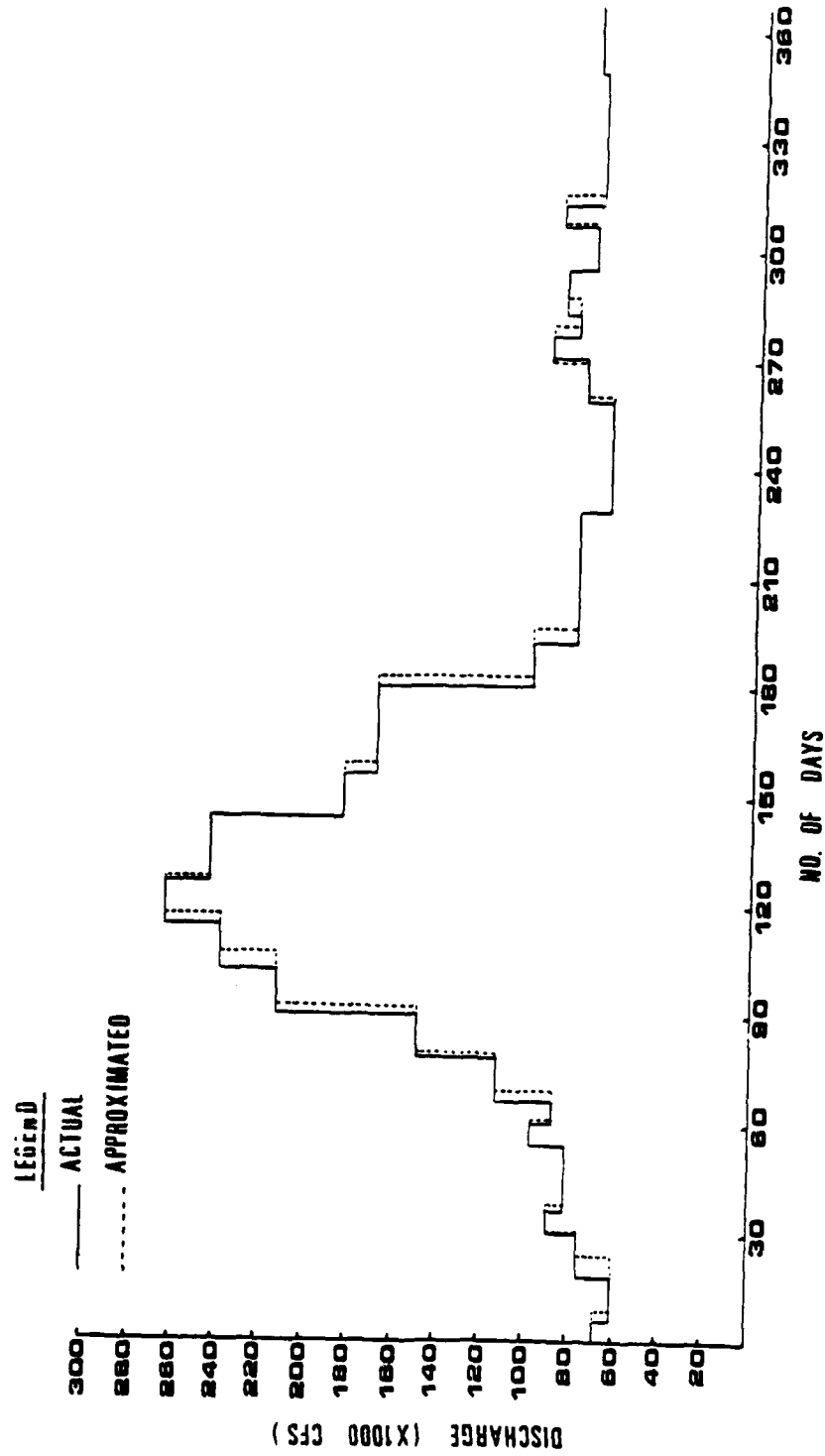


Figure 4.5. Actual and approximated average discharge hydrograph for 1965-1981 used for Stage II Cofferdam study.

Results of the water surface profile computations are summarized in Table 4.3a. Table 4.3b presents the computed water surface profiles with 24 day time intervals. These results are displayed in Fig. 4.6.

The difference between measured water surface elevations from W.E.S. physical model study and the computed results are within ± 1.5 ft. The discrepancy is attributed to i) 1/100 model scale, ii) the use of May 1983 cross sections in the present study.

Due to the scale of the model, any difference between measured and computed results is amplified by a factor of 100. The use of different channel cross sections also affect the computations. Taking these points under consideration the results are in close agreement.

4.2.2 Sediment Routing Computations

Starting with May 7, 1983 cross sections the Streamtube Computer Model was applied to Stage II cofferdam design. Sediment routing computations were carried out with a time step of 6 days.

Numerical experiments for the Stage I cofferdam study had shown the dominant sediment size for the period following March 10, 1982 to be 2-10 mm. For this final phase of the study similar experiments were conducted. Assuming the alluvium layer sediment size distribution resulted in large, and unrealistic scour patterns.

Since the alluvium layer was extending only down to elevation 344 ft, and since the observed bed topography had not shown any significant changes after December 1982 and April 1983 floods, the dominant sediment size is predicted to be the 3-10 mm range. Because of the unusually large floods which were experienced at the Stage I cofferdam site in the past 2 years, the assumption of this coarser size is quite realistic. It is believed that the finer sediment is removed

Table 4.3a. Summary of water surface elevation computations
for Mississippi River, RM 199.3 - 201.0 (Stage II
Cofferdam Study)

Day Number	Discharge (cfs)	Measured W.S.E.		
		Control W.S.E. at RM 199.3 (ft) N.V.G.D.	at RM 201.0 W.E.S. Model (ft) N.V.G.D.	Computed W.S.E. at RM 201.0 (ft) N.V.G.D.
24	76,000	401.00	402.0	401.57
48	82,000	401.20	402.4	401.86
72	114,000	403.80	405.0	404.83
96	214,000	411.00	411.5	412.54
120	265,000	414.50	415.40	416.24
144	245,000	413.00	413.50	414.44
168	150,000	406.30	408.20	407.37
192	100,000	402.60	405.0	403.36
216	8,000	406.20	403.0(?)	406.68
240	66,000	400.20	402.0	400.66
264	78,000	401.20	403.0	401.76
288	88,000	402.00	404.0	402.64
312	90,000	402.00	409.8	402.68
336	72,000	400.60	402.5	401.12
360	75,000	400.90	402.0	401.43

Table 4.3b. Computed water surface profiles for Mississippi River RM 199.3 - 201.0

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A, PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0									
INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	ELEVATION
(1)	8976.0	401.57	(7)	9025.6	401.42	(13)	6758.4	401.15	
(2)	8764.8	401.56	(8)	7867.2	401.40	(14)	6494.4	401.12	
(3)	8553.6	401.54	(9)	7688.8	401.39	(15)	6177.6	401.11	
(4)	8448.0	401.50	(10)	7497.6	401.36	(16)	5898.0	401.11	
(5)	8342.4	401.46	(11)	7286.4	401.26	(17)	5280.0	401.09	
(6)	8184.0	401.44	(12)	7022.4	401.25	(18)	3950.0	401.07	
						(19)	0.	401.06	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A, PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0									
INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	ELEVATION
(1)	8976.0	401.26	(7)	9025.6	401.65	(13)	6758.4	401.37	
(2)	8764.8	401.23	(8)	7867.2	401.63	(14)	6494.4	401.34	
(3)	8553.6	401.81	(9)	7688.8	401.62	(15)	6177.6	401.33	
(4)	8448.0	401.77	(10)	7497.6	401.69	(16)	5898.0	401.32	
(5)	8342.4	401.68	(11)	7286.4	401.49	(17)	5280.0	401.30	
(6)	8184.0	401.67	(12)	7022.4	401.47	(18)	3950.0	401.28	
						(19)	0.	401.20	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A, PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0									
INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	ELEVATION
(1)	8976.0	404.83	(7)	9025.6	404.46	(13)	6758.4	404.13	
(2)	8764.8	404.78	(8)	7867.2	404.43	(14)	6494.4	404.08	
(3)	8553.6	404.74	(9)	7688.8	404.40	(15)	6177.6	404.07	
(4)	8448.0	404.66	(10)	7497.6	404.36	(16)	5898.0	403.97	
(5)	8342.4	404.49	(11)	7286.4	404.26	(17)	5280.0	403.95	
(6)	8184.0	404.48	(12)	7022.4	404.23	(18)	3950.0	403.92	
						(19)	0.	403.80	

Table 4.3b. Continued.

N A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A. WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0 DAY 95					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	8276.0	412.54	(7)	8025.6	412.03
(2)	8764.8	412.62	(8)	7957.2	411.95
(3)	8553.6	412.42	(9)	7798.8	411.92
(4)	8448.0	412.35	(10)	7497.6	411.82
(5)	8342.4	412.18	(11)	7286.4	411.72
(6)	8184.0	412.00	(12)	7022.4	411.71
			(13)	6758.4	411.61
			(14)	6494.4	411.48
			(15)	6177.6	411.47
			(16)	5898.0	411.37
			(17)	5280.0	411.27
			(18)	3860.0	411.24
			(19)	0.	411.00

N A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A. WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0 DAY 129					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	8276.0	415.24	(7)	8025.6	415.62
(2)	8764.8	415.22	(8)	7957.2	415.51
(3)	8553.6	415.12	(9)	7798.8	415.46
(4)	8448.0	415.04	(10)	7497.6	415.32
(5)	8342.4	415.74	(11)	7286.4	415.22
(6)	8184.0	415.70	(12)	7022.4	415.20
			(13)	6758.4	415.10
			(14)	6494.4	415.03
			(15)	6177.6	414.80
			(16)	5898.0	414.80
			(17)	5280.0	414.70
			(18)	3860.0	414.78
			(19)	0.	414.50

N A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A. WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0 DAY 144					
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION
(1)	8276.0	414.44	(7)	8025.6	413.90
(2)	8764.8	414.42	(8)	7957.2	413.81
(3)	8553.6	414.32	(9)	7798.8	413.76
(4)	8448.0	414.27	(10)	7497.6	413.65
(5)	8342.4	414.01	(11)	7286.4	413.55
(6)	8184.0	413.97	(12)	7022.4	413.53
			(13)	6758.4	413.43
			(14)	6494.4	413.40
			(15)	6177.6	413.37
			(16)	5898.0	413.26
			(17)	5280.0	413.25
			(18)	3860.0	413.25
			(19)	0.	413.00

Table 4.3b. Continued.

MAP A OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A, SURFACE PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0 DAY 163									
INDEX	DISTANCE	WATER ELEVATION	INDEX	DISTANCE	WATER ELEVATION	INDEX	DISTANCE	WATER ELEVATION	ELEVATION
(1)	8376.0	407.37	(7)	8025.6	406.92	(13)	6758.4	406.80	
(2)	8764.8	407.28	(8)	7887.2	406.88	(14)	6494.4	406.59	
(3)	8853.6	407.21	(9)	7708.8	406.86	(15)	6177.6	406.49	
(4)	8448.0	407.10	(10)	7497.6	406.81	(16)	5808.0	406.48	
(5)	8342.4	406.98	(11)	7286.4	406.71	(17)	5280.0	406.47	
(6)	8184.0	406.96	(12)	7022.4	406.70	(18)	3950.0	406.45	
						(19)	0.	406.38	

MAP A OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A, SURFACE PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0 DAY 192									
INDEX	DISTANCE	WATER ELEVATION	INDEX	DISTANCE	WATER ELEVATION	INDEX	DISTANCE	WATER ELEVATION	ELEVATION
(1)	8376.0	403.26	(7)	8025.6	403.10	(13)	6758.4	402.83	
(2)	8764.8	403.23	(8)	7887.2	403.07	(14)	6494.4	402.75	
(3)	8853.6	403.30	(9)	7708.8	403.06	(15)	6177.6	402.74	
(4)	8448.0	403.24	(10)	7497.6	403.03	(16)	5808.0	402.73	
(5)	8342.4	403.13	(11)	7286.4	402.93	(17)	5280.0	402.71	
(6)	8184.0	403.12	(12)	7022.4	402.93	(18)	3950.0	402.69	
						(19)	0.	402.60	

MAP A OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A, SURFACE PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0 DAY 216									
INDEX	DISTANCE	WATER ELEVATION	INDEX	DISTANCE	WATER ELEVATION	INDEX	DISTANCE	WATER ELEVATION	ELEVATION
(1)	8376.0	406.68	(7)	8025.6	406.53	(13)	6758.4	406.30	
(2)	8764.8	406.66	(8)	7887.2	406.52	(14)	6494.4	406.28	
(3)	8853.6	406.64	(9)	7708.8	406.51	(15)	6177.6	406.25	
(4)	8448.0	406.61	(10)	7497.6	406.50	(16)	5808.0	406.25	
(5)	8342.4	406.56	(11)	7286.4	406.48	(17)	5280.0	406.25	
(6)	8184.0	406.54	(12)	7022.4	406.48	(18)	3950.0	406.24	
						(19)	0.	406.20	

Table 4.3b. Continued.

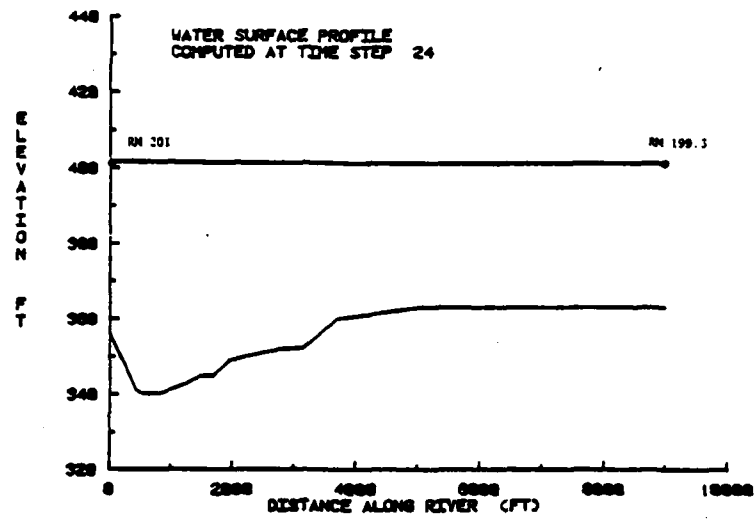
NAPA OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A, WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0 DAY 248									
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION	ELEVATION
(1)	8976.0	400.66	(7)	9025.6	400.55	(13)	6758.4	400.31	
(2)	8764.8	400.66	(8)	7857.2	400.54	(14)	6494.4	400.29	
(3)	8553.6	400.64	(9)	7708.8	400.53	(15)	6177.6	400.28	
(4)	8448.0	400.62	(10)	7497.6	400.52	(16)	5860.8	400.27	
(5)	8342.4	400.67	(11)	7286.4	400.43	(17)	5544.0	400.26	
(6)	8184.0	400.66	(12)	7022.4	400.41	(18)	5228.0	400.25	
						(19)	3560.0	400.20	
NAPA OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A, WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0 DAY 254									
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION	ELEVATION
(1)	8976.0	401.76	(7)	9025.6	401.60	(13)	6758.4	401.35	
(2)	8764.8	401.74	(8)	7857.2	401.58	(14)	6494.4	401.31	
(3)	8553.6	401.73	(9)	7708.8	401.57	(15)	6177.6	401.30	
(4)	8448.0	401.69	(10)	7497.6	401.55	(16)	5860.8	401.29	
(5)	8342.4	401.62	(11)	7286.4	401.45	(17)	5544.0	401.28	
(6)	8184.0	401.61	(12)	7022.4	401.45	(18)	5228.0	401.26	
						(19)	3560.0	401.20	
NAPA OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A, WATER SURFACE PROFILE FOR MISSISSIPPI RIVER RM 199.3-201.0 DAY 288									
INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION	INDEX	DISTANCE	ELEVATION	ELEVATION
(1)	8976.0	402.64	(7)	9025.6	402.44	(13)	6758.4	402.18	
(2)	8764.8	402.62	(8)	7857.2	402.42	(14)	6494.4	402.12	
(3)	8553.6	402.59	(9)	7708.8	402.41	(15)	6177.6	402.11	
(4)	8448.0	402.55	(10)	7497.6	402.39	(16)	5860.8	402.10	
(5)	8342.4	402.48	(11)	7286.4	402.32	(17)	5544.0	402.09	
(6)	8184.0	402.45	(12)	7022.4	402.25	(18)	5228.0	402.07	
						(19)	3560.0	402.00	

Table 4.3b. Continued.

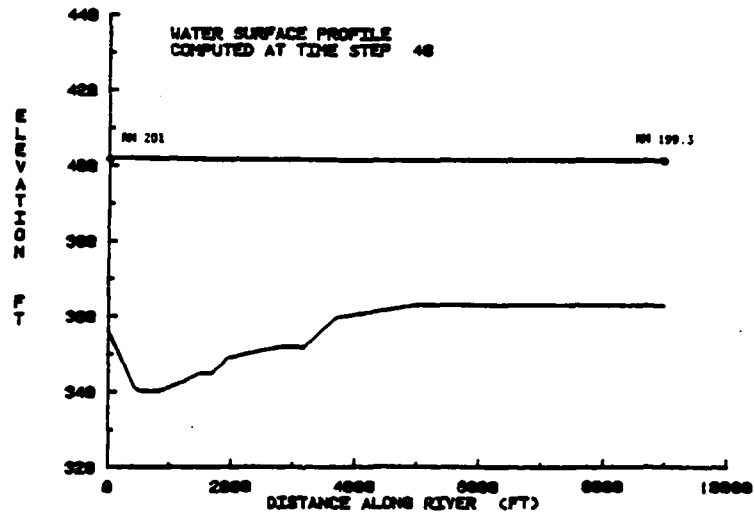
MAP OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A, 199.3-201.0 DAY 312									
INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	ELEVATION
(1)	8976.0	402.69	(7)	8025.6	402.45	(13)	6758.4	402.19	402.19
(2)	8764.8	402.65	(8)	7867.2	402.43	(14)	6494.4	402.13	402.13
(3)	8553.6	402.62	(9)	7708.8	402.42	(15)	6177.6	402.12	402.12
(4)	8448.0	402.57	(10)	7497.6	402.40	(16)	5808.0	402.11	402.11
(5)	8342.4	402.48	(11)	7286.4	402.38	(17)	5288.0	402.09	402.09
(6)	8184.0	402.47	(12)	7022.4	402.29	(18)	3960.0	402.08	402.08
						(19)	0.	402.00	402.00

MAP OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A, 199.3-201.0 DAY 336									
INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	ELEVATION
(1)	8976.0	401.12	(7)	8025.6	400.98	(13)	6758.4	400.74	400.74
(2)	8764.8	401.11	(8)	7867.2	400.97	(14)	6494.4	400.70	400.70
(3)	8553.6	401.09	(9)	7708.8	400.96	(15)	6177.6	400.69	400.69
(4)	8448.0	401.07	(10)	7497.6	400.94	(16)	5808.0	400.68	400.68
(5)	8342.4	401.06	(11)	7286.4	400.84	(17)	5288.0	400.67	400.67
(6)	8184.0	401.06	(12)	7022.4	400.84	(18)	3960.0	400.66	400.66
						(19)	0.	400.60	400.60

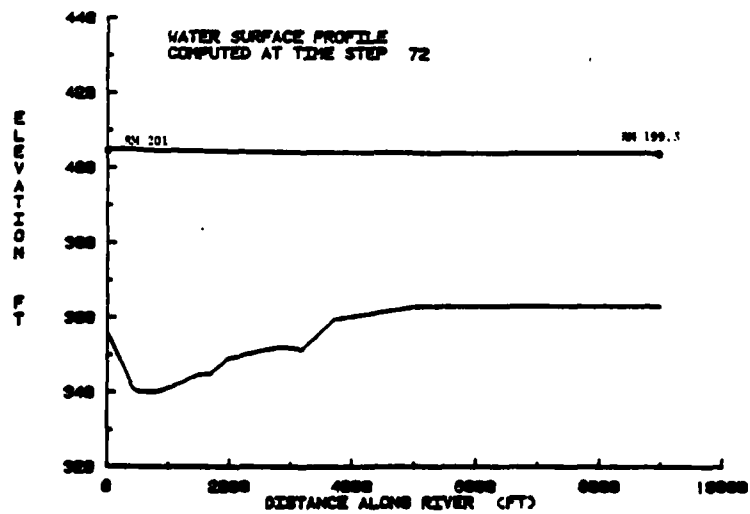
MAP OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A, 199.3-201.0 DAY 360									
INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	INDEX	DISTANCE	WATER SURFACE ELEVATION	ELEVATION
(1)	8976.0	401.43	(7)	8025.6	401.28	(13)	6758.4	401.03	401.03
(2)	8764.8	401.41	(8)	7867.2	401.27	(14)	6494.4	401.00	401.00
(3)	8553.6	401.40	(9)	7708.8	401.26	(15)	6177.6	401.00	401.00
(4)	8448.0	401.37	(10)	7497.6	401.24	(16)	5808.0	400.99	400.99
(5)	8342.4	401.36	(11)	7286.4	401.14	(17)	5288.0	400.97	400.97
(6)	8184.0	401.36	(12)	7022.4	401.13	(18)	3960.0	400.96	400.96
						(19)	0.	400.90	400.90



(a)

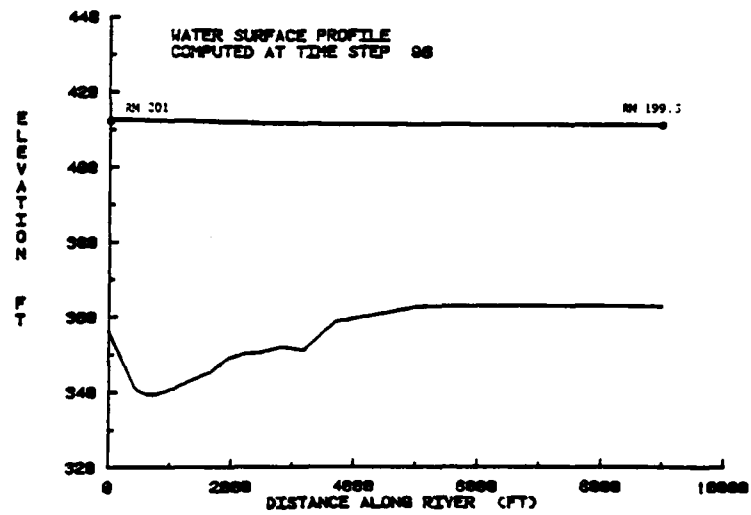


(b)

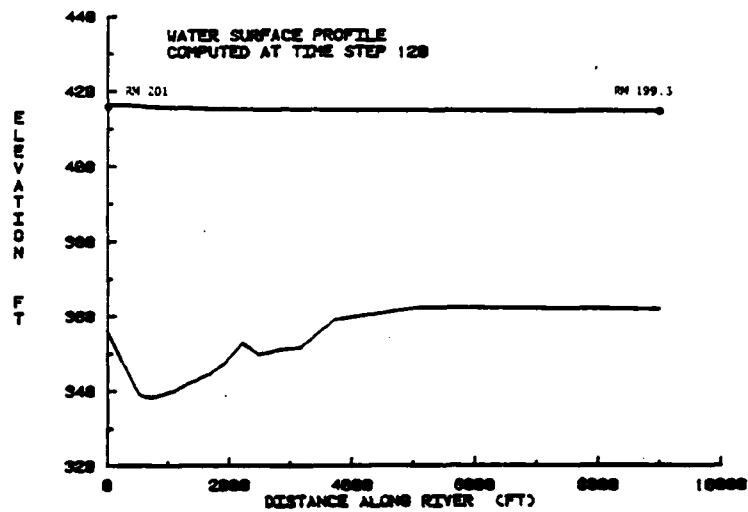


(c)

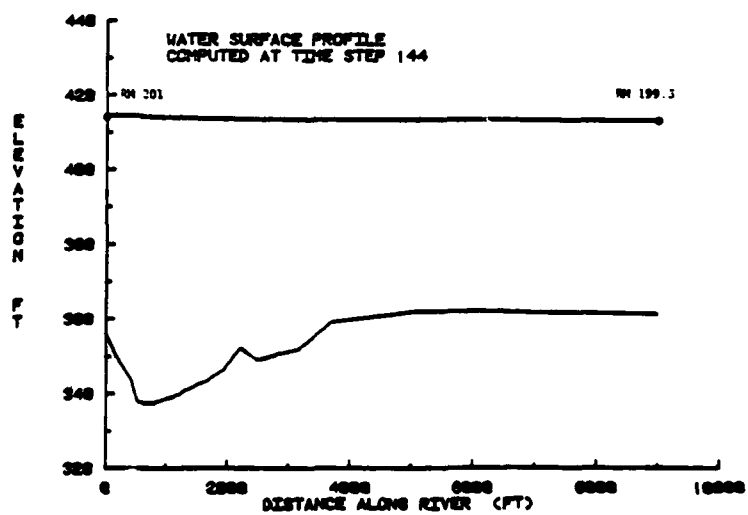
Figure 4.6. Computed water surface profiles for Stage II Cofferdam.



(d)

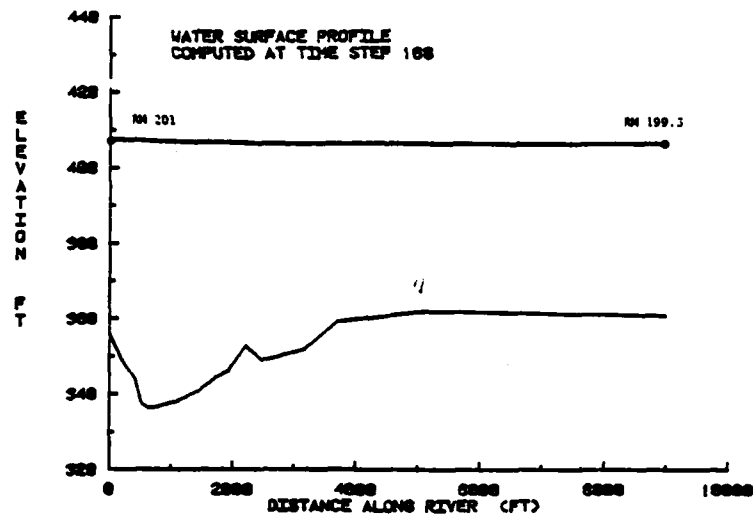


(e)

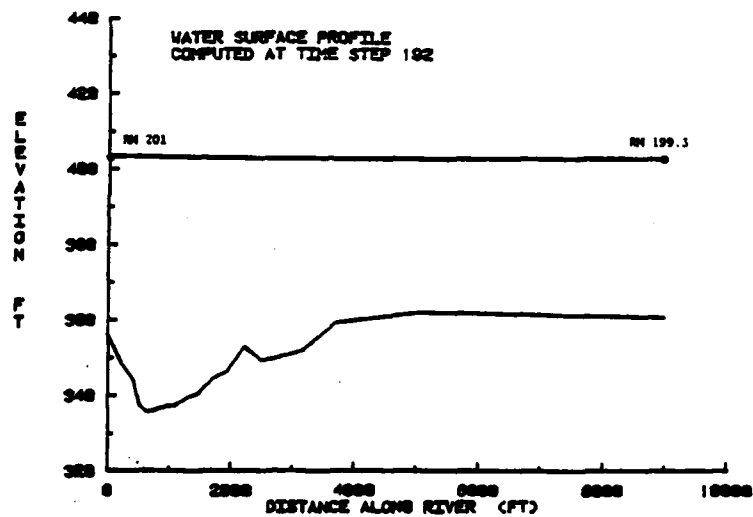


(f)

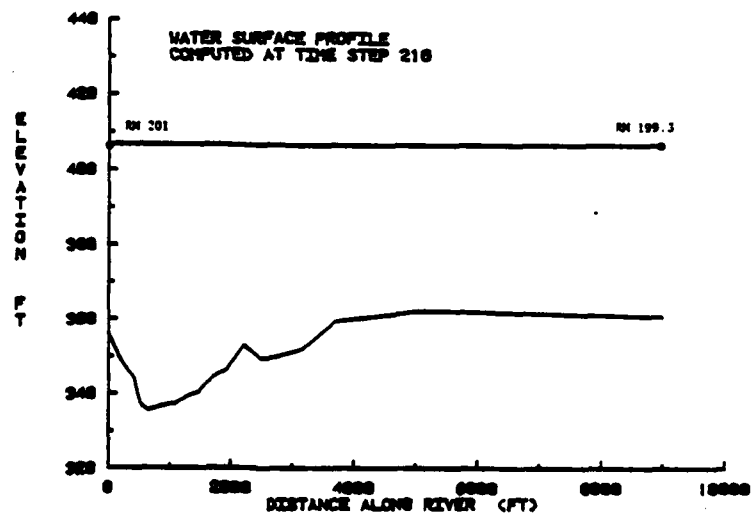
Figure 4.6. Continued.



(g)

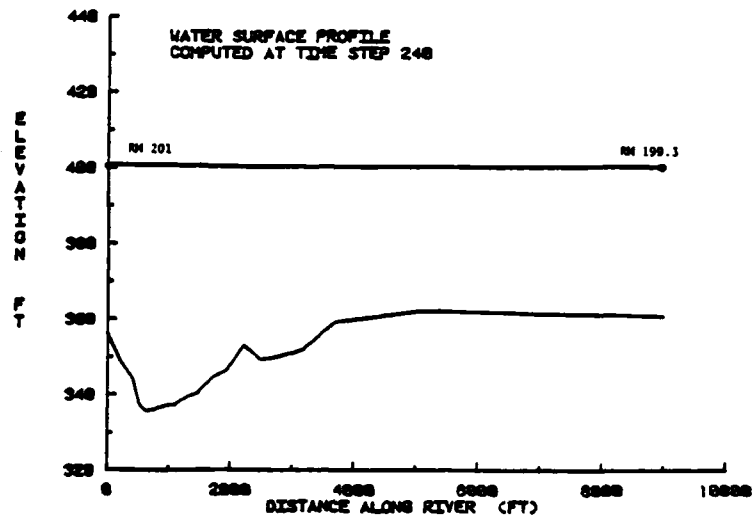


(h)

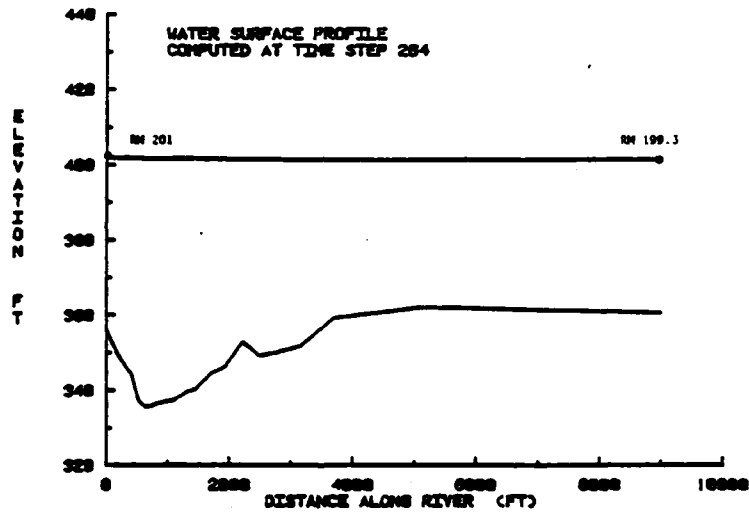


(i)

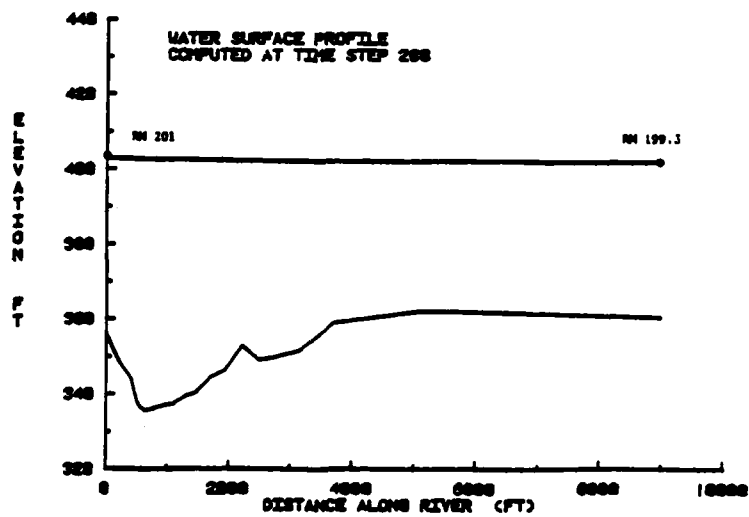
Figure 4.6. Continued.



(j)

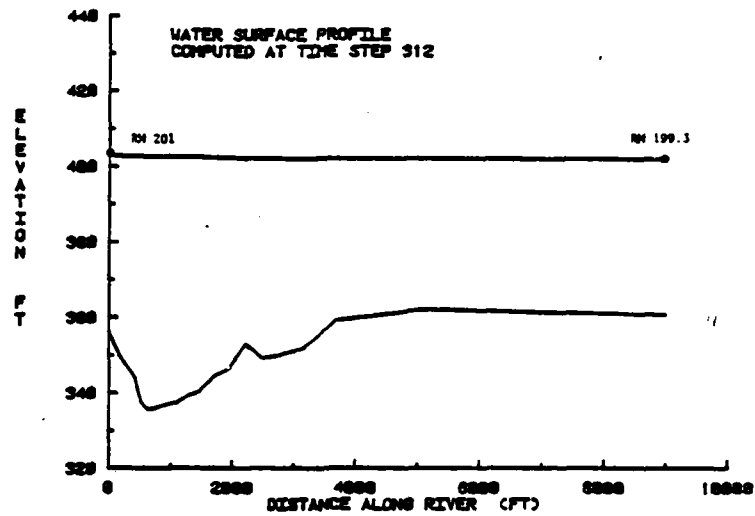


(k)

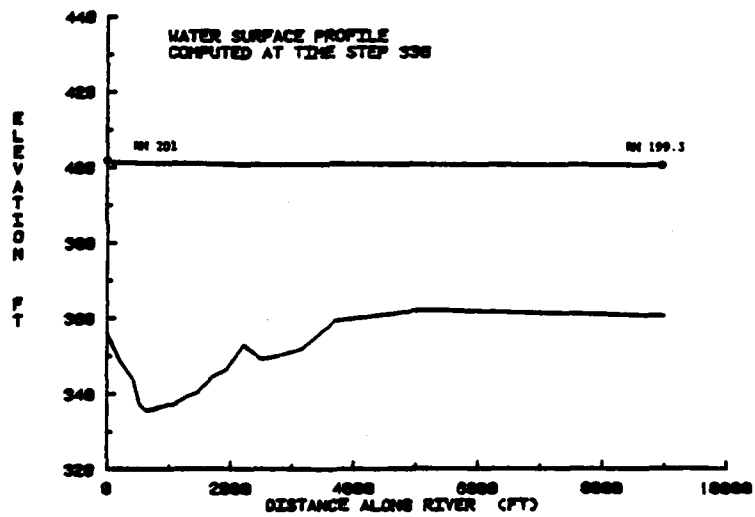


(l)

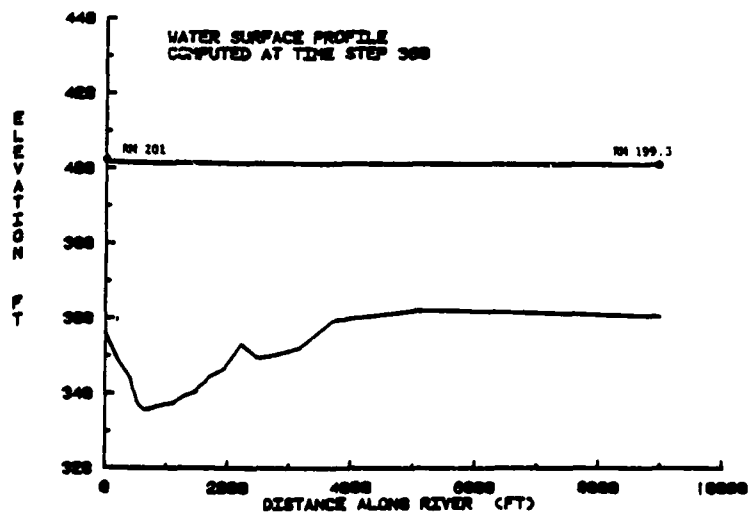
Figure 4.6. Continued.



(m)



(n)



(o)

Figure 4.6. Continued.

from the alluvium and, wherever exposed, from the outwash layers. Results of sediment routing computations are tabulated in Tables 4.4 through 4.18. The computed channel cross sections at different times are given in Fig. 4.7 through Fig. 4.21, and are displayed in the form of contour maps in Figs. 4.22 through 4.27.

Figures 4.21 through 4.27 show the expansion of the 340 ft contour line located initially between RM 200.92 and 200.82 with time. At the time step 120, the 340 ft contour line extends up to RM 200.79 and at time step 180 all the way down to RM 200.72. Also at time steps 180, the development of 335 ft contour line can be observed. After the 180th time step, the river bed undergoes little change.

The concentrated scour zone formed during the first 180 time steps at the channel constriction, between River Miles 200.90 and 200.76, remain practically unchanged for the remaining computation time steps.

Table 4.4. Channel cross section plots at station 8764.8 ft.

N A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A.					
CHANNEL CROSS SECTION PLOTS AT STATION			8764.8 FT DAY 72		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00	(7)	347.00	365.00
(2)	71.000	420.00	(8)	339.00	360.00
(3)	161.00	410.00	(9)	345.00	355.00
(4)	222.00	390.00	(10)	400.00	352.50
(5)	305.00	375.00	(11)	450.00	352.00
(6)	318.00	370.00	(12)	500.00	352.00
			(13)	550.00	351.00
			(14)	58.00	350.00
			(15)	80.00	350.00
			(16)	200.00	349.00
			(17)	700.00	349.00
			(18)	749.00	349.00

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION FLOWS AT STATION					8764.8 FT DAY 144				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)		439.00	(7)	327.00	365.34	(13)	550.00		351.00
(2)	71.000	429.00	(8)	329.00	369.34	(14)	584.00		350.00
(3)	151.00	416.34	(9)	345.00	365.34	(15)	600.00		350.00
(4)	232.00	380.34	(10)	400.00	362.04	(16)	650.00		348.95
(5)	306.00	376.34	(11)	450.00	362.34	(17)	700.00		348.95
(6)	318.00	370.34	(12)	500.00	362.00	(18)	749.98		348.95

MAP OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION					PLOTS AT STATION				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
1	0	430.00	(7)	327.00	365.37	(13)	550.00	351.01	
2	71.000	422.00	(8)	329.00	360.37	(14)	584.00	350.01	
3	161.00	410.34	(9)	345.00	355.37	(15)	600.00	350.01	
4	222.00	390.37	(10)	400.00	352.87	(16)	650.00	348.95	
5	346.00	375.37	(11)	450.00	352.37	(17)	700.00	348.95	
6	318.00	370.37	(12)	500.00	352.01	(18)	748.97	348.96	

Table 4.4. Continued.

M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A,					
CHANNEL CROSS SECTION PLOTS AT STATION					
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00	(7)	327.00	365.37
(2)	71.000	420.00	(8)	329.00	360.37
(3)	161.00	410.34	(9)	345.00	355.37
(4)	222.00	380.37	(10)	400.00	352.87
(5)	305.00	375.37	(11)	450.00	352.37
(6)	318.00	370.37	(12)	500.00	352.01
8764.8 FT DAY 288					
			(13)	550.00	351.01
			(14)	584.00	350.01
			(15)	600.00	348.95
			(16)	650.00	348.95
			(17)	700.00	348.95
			(18)	749.96	348.96
M A P A O U T P U T					
POINTS PLOTTED FOR GRAPH, 1A,					
CHANNEL CROSS SECTION PLOTS AT STATION					
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	430.00	(7)	327.00	365.37
(2)	71.000	420.00	(8)	329.00	360.37
(3)	161.00	410.34	(9)	345.00	355.37
(4)	222.00	380.37	(10)	400.00	352.87
(5)	305.00	375.37	(11)	450.00	352.37
(6)	318.00	370.37	(12)	500.00	352.01
8764.8 FT DAY 360					
			(13)	550.00	351.01
			(14)	584.00	350.01
			(15)	600.00	348.95
			(16)	650.00	348.95
			(17)	700.00	348.95
			(18)	749.94	348.96

Table 4.4. Continued.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION		PLOTS AT STATION		8553.6 FT DAY 72		INDEX		HOR. DIST	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	63.000	430.00	(7)	278.00	355.00	(13)	500.00	342.00	
(2)	153.00	420.00	(8)	284.00	350.00	(14)	550.00	341.00	
(3)	227.00	410.00	(9)	290.00	350.00	(15)	600.00	341.00	
(4)	287.00	390.00	(10)	310.00	350.00	(16)	650.00	344.00	
(5)	351.00	375.00	(11)	328.00	345.00	(17)	700.00	344.00	
(6)	367.00	370.00	(12)	450.00	343.00	(18)	713.00	345.00	
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION		PLOTS AT STATION		8553.6 FT DAY 144		INDEX		HOR. DIST	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	63.000	430.00	(7)	278.00	355.00	(13)	500.00	344.50	
(2)	153.00	420.00	(8)	284.00	350.00	(14)	550.00	343.50	
(3)	227.00	410.00	(9)	294.00	350.00	(15)	600.00	343.93	
(4)	287.00	390.00	(10)	310.00	350.00	(16)	650.00	346.93	
(5)	351.00	375.00	(11)	328.00	345.00	(17)	700.00	345.93	
(6)	367.00	370.00	(12)	450.00	345.50	(18)	713.00	347.93	
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION		PLOTS AT STATION		8553.6 FT DAY 216		INDEX		HOR. DIST	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	63.000	430.00	(7)	278.00	355.83	(13)	500.00	344.79	
(2)	153.00	420.00	(8)	285.00	350.83	(14)	550.00	343.79	
(3)	227.00	410.00	(9)	294.00	355.83	(15)	600.00	344.29	
(4)	287.00	390.00	(10)	310.00	350.83	(16)	650.00	347.29	
(5)	351.00	375.83	(11)	328.00	345.83	(17)	700.00	347.29	
(6)	367.00	370.83	(12)	450.00	345.79	(18)	713.97	348.29	

Table 4.5. Channel cross section plots at station 8448.0 ft.

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0.	430.00	(6)	271.00	370.00	(11)	322.00	345.00	
(2)	65.000	420.00	(7)	278.00	355.00	(12)	328.00	340.00	
(3)	181.00	410.00	(8)	284.00	350.00	(13)	450.00	340.00	
(4)	255.00	390.00	(9)	290.00	355.00	(14)	525.00	340.00	
(5)	283.00	375.00	(10)	298.00	360.00	(15)	550.00	341.00	
						(16)	600.00	342.00	
						(17)	640.00	343.00	
N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0.	430.00	(6)	271.00	368.79	(11)	322.00	343.79	
(2)	65.000	420.00	(7)	278.00	363.79	(12)	328.00	338.79	
(3)	181.00	408.00	(8)	284.00	358.79	(13)	450.00	337.67	
(4)	255.00	378.79	(9)	290.00	353.79	(14)	525.00	337.68	
(5)	283.00	373.79	(10)	298.00	348.79	(15)	550.00	338.68	
						(16)	600.00	339.68	
						(17)	640.00	340.68	
N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0.	430.00	(6)	271.00	368.76	(11)	322.00	343.76	
(2)	65.000	420.00	(7)	278.00	363.76	(12)	328.00	338.76	
(3)	181.00	408.77	(8)	284.00	358.76	(13)	450.00	337.47	
(4)	255.00	378.76	(9)	290.00	353.76	(14)	525.00	337.49	
(5)	283.00	373.76	(10)	298.00	348.76	(15)	550.00	338.60	
						(16)	600.00	339.60	
						(17)	640.00	340.60	

Table 4.5. Continued.

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION		PLOTS AT STATION		8448.0 FT DAY 288		8448.0 FT DAY 350		ELEVATION	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(6)	271.00	358.76	(11)	322.00	343.76	
(2)	45.000	420.00	(7)	278.00	353.76	(12)	328.00	338.76	
(3)	181.00	408.77	(8)	284.00	358.76	(13)	450.00	337.47	
(4)	282.00	378.76	(9)	290.00	353.76	(14)	555.00	337.49	
(5)	283.00	373.76	(10)	298.00	348.76	(15)	550.00	336.50	
						(16)	600.00	336.50	
						(17)	649.05	340.50	

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION		PLOTS AT STATION		8448.0 FT DAY 288		8448.0 FT DAY 350		ELEVATION	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(6)	271.00	358.76	(11)	322.00	343.76	
(2)	45.000	420.00	(7)	278.00	353.76	(12)	328.00	338.76	
(3)	181.00	408.77	(8)	284.00	358.76	(13)	450.00	337.47	
(4)	282.00	378.76	(9)	290.00	353.76	(14)	555.00	337.49	
(5)	283.00	373.76	(10)	298.00	348.76	(15)	550.00	336.50	
						(16)	600.00	336.50	
						(17)	649.04	340.50	

Table 4.6. Channel cross section plots at station 8342.4 ft.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0.	430.00	(6)	278.00	359.99	(11)	314.00	344.99	
(2)	71.000	420.00	(7)	286.00	364.99	(12)	357.00	339.99	
(3)	173.00	410.00	(8)	294.00	359.99	(13)	400.00	339.99	
(4)	267.00	379.00	(9)	298.00	354.99	(14)	455.00	339.99	
(5)	275.00	374.00	(10)	306.00	349.99	(15)	500.00	340.97	
						(16)	549.99	341.97	
8342.4 FT DAY 72									
INDEX HOR. DIST									
ELEVATION									
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Table 4.6. Continued.

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0	439.00	(6)	278.00	356.60	(11)	314.00	341.60	
(2)	71.000	429.00	(7)	286.00	351.60	(12)	357.00	336.60	
(3)	173.00	407.23	(8)	294.00	356.60	(13)	400.00	335.45	
(4)	267.00	376.00	(9)	298.00	351.60	(14)	455.00	335.45	
(5)	275.00	371.00	(10)	306.00	346.60	(15)	500.00	336.48	
						(16)	549.94	337.48	
8342.4 FT DAY 288									
INDEX HOR. DIST									
ELEVATION									
8342.4 FT DAY 360									
INDEX HOR. DIST									
ELEVATION									
(1)	0	439.00	(6)	278.00	356.60	(11)	314.00	341.60	
(2)	71.000	429.00	(7)	286.00	351.60	(12)	357.00	336.60	
(3)	173.00	407.23	(8)	294.00	356.60	(13)	400.00	335.45	
(4)	267.00	376.00	(9)	298.00	351.60	(14)	455.00	335.45	
(5)	275.00	371.00	(10)	306.00	346.60	(15)	500.00	336.48	
						(16)	549.94	337.48	

Table 4.6. Continued.

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION		ELEVATION		INDEX		HOR. DIST		ELEVATION	
INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST
(1)	0.	439.00	(6)	275.00	378.00	(11)	318.00	345.00	
(2)	71.000	429.00	(7)	284.00	383.00	(12)	329.00	346.00	
(3)	192.00	419.00	(8)	294.00	388.00	(13)	338.00	346.01	
(4)	251.00	399.00	(9)	299.00	351.00	(14)	450.00	341.01	
(5)	257.00	378.00	(10)	310.00	350.00	(15)	500.00	341.51	
						(16)	549.00	342.01	

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION		ELEVATION		INDEX		HOR. DIST		ELEVATION	
INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST
(1)	0.	439.00	(6)	275.00	367.72	(11)	318.00	342.72	
(2)	71.000	429.00	(7)	284.00	367.72	(12)	329.00	337.72	
(3)	192.00	407.74	(8)	294.00	367.72	(13)	338.00	337.24	
(4)	251.00	377.72	(9)	299.00	367.72	(14)	450.00	338.24	
(5)	257.00	372.72	(10)	310.00	347.72	(15)	500.00	338.77	
						(16)	549.00	339.27	

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION		ELEVATION		INDEX		HOR. DIST		ELEVATION	
INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST
(1)	0.	439.00	(6)	275.00	357.51	(11)	318.00	342.51	
(2)	71.000	429.00	(7)	284.00	357.51	(12)	329.00	337.51	
(3)	192.00	407.57	(8)	294.00	357.51	(13)	338.00	336.37	
(4)	251.00	377.51	(9)	299.00	357.51	(14)	450.00	337.37	
(5)	257.00	372.51	(10)	310.00	347.51	(15)	500.00	337.87	
						(16)	549.00	338.47	

Table 4.6. Continued.

[illegible]

Table 4.7. Channel cross section plots at station 8025.6 ft at different times.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION PLOTS AT STATION		ELEVATION		INDEX		HOR. DIST		ELEVATION	
INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST
(1)	0.	430.00	(6)	275.00	359.99	(11)	337.00	344.99	
(2)	67.000	426.00	(7)	282.00	364.99	(12)	400.00	340.92	
(3)	200.00	410.00	(8)	298.00	359.99	(13)	450.00	341.92	
(4)	251.00	379.99	(9)	314.00	354.99	(14)	500.00	341.92	
(5)	263.00	374.00	(10)	320.00	349.99	(15)	549.99	342.92	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION PLOTS AT STATION		ELEVATION		INDEX		HOR. DIST		ELEVATION	
INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST
(1)	0.	430.00	(6)	275.00	367.59	(11)	337.00	342.59	
(2)	67.000	426.00	(7)	282.00	362.59	(12)	400.00	338.22	
(3)	200.00	407.74	(8)	298.00	357.59	(13)	450.00	339.22	
(4)	251.00	372.59	(9)	314.00	352.59	(14)	500.00	339.23	
(5)	263.00	372.59	(10)	320.00	347.59	(15)	549.99	340.23	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION PLOTS AT STATION		ELEVATION		INDEX		HOR. DIST		ELEVATION	
INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST	ELEVATION		INDEX	HOR. DIST
(1)	0.	430.00	(6)	275.00	357.18	(11)	337.00	342.18	
(2)	67.000	426.00	(7)	282.00	352.18	(12)	400.00	337.21	
(3)	200.00	407.48	(8)	298.00	357.18	(13)	450.00	338.21	
(4)	251.00	377.18	(9)	314.00	352.18	(14)	500.00	338.20	
(5)	263.00	372.18	(10)	320.00	347.18	(15)	549.97	339.20	

Table 4.7. Continued.

N A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A,				
CHANNEL CROSS SECTION PLOTS AT STATION				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST
(1)	0.	430.00	(6)	275.00
(2)	67.000	420.00	(7)	282.00
(3)	248.00	407.48	(8)	298.00
(4)	251.00	377.18	(9)	314.00
(5)	253.00	372.18	(10)	329.00
				347.18
				367.18
				382.18
				357.18
				352.18
				347.18
				342.18
				337.18
				338.19
				338.19
				339.19

8025.6 FT DAY 288
INDEX HOR. DIST
(11) 337.00
(12) 400.00
(13) 450.00
(14) 500.00
(15) 549.04

N A P A O U T P U T				
POINTS PLOTTED FOR GRAPH, 1A,				
CHANNEL CROSS SECTION PLOTS AT STATION				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST
(1)	0.	430.00	(6)	275.00
(2)	67.000	420.00	(7)	282.00
(3)	248.00	407.48	(8)	298.00
(4)	251.00	377.18	(9)	314.00
(5)	253.00	372.18	(10)	329.00
				347.18
				362.18
				357.18
				352.18
				347.18
				342.18
				337.18
				338.19
				338.19
				339.19

8025.6 FT DAY 360
INDEX HOR. DIST
(11) 337.00
(12) 400.00
(13) 450.00
(14) 500.00
(15) 549.04

Table 4.8. Channel cross section plots at station 7867.2 ft at different times.

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0.	438.00	(8)	263.00	374.98	(9)	345.00	354.98	
(2)	71.000	428.00	(9)	275.00	369.98	(10)	351.00	349.98	
(3)	224.00	418.00	(7)	286.00	364.98	(11)	373.00	344.98	
(4)	247.00	379.98	(8)	314.00	359.98	(12)	459.00	341.80	
						(13)	509.00	343.79	
						(14)	549.00	343.79	
N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0.	438.00	(8)	263.00	378.50	(9)	345.00	352.50	
(2)	71.000	428.00	(9)	275.00	367.50	(10)	351.00	347.50	
(3)	224.00	407.74	(7)	286.00	359.50	(11)	373.00	342.50	
(4)	247.00	377.50	(8)	314.00	357.50	(12)	459.00	338.94	
						(13)	509.00	349.93	
						(14)	549.00	349.93	
N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0.	438.00	(8)	263.00	371.89	(9)	345.00	351.89	
(2)	71.000	428.00	(9)	275.00	368.89	(10)	351.00	346.89	
(3)	224.00	407.36	(7)	286.00	361.89	(11)	373.00	341.89	
(4)	247.00	376.89	(8)	314.00	356.89	(12)	459.00	337.49	
						(13)	509.00	339.38	
						(14)	549.00	339.38	

Table 4.8. Continued.

[illegible]

Table 4.9. Channel cross section plots at station 7708.8 ft at different times.

MAP OUTPUT									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
ELEVATION		INDEX		HOR. DIST		ELEVATION		INDEX	
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0.	430.00	(5)	251.00	375.00	(9)	333.00	355.00	
(2)	71.000	429.00	(6)	256.00	370.00	(10)	376.00	350.00	
(3)	236.00	410.00	(7)	310.00	365.00	(11)	404.00	344.94	
(4)	239.00	380.00	(8)	323.00	360.00	(12)	450.00	342.94	
						(13)	500.00	343.93	
						(14)	552.99	344.93	

N A P A O U T P U T											
POINTS PLOTTED FOR GRAPH. 1A.											
CHANNEL CROSS SECTION PLOTS AT STATION											
INDEX		HOR. DIST		ELEVATION		INDEX		HOR. DIST		ELEVATION	
(1)	0.			436.00	(5)	251.00		372.70	(9)	333.00	352.70
(2)	71.000			420.00	(6)	286.00		367.70	(10)	376.00	347.70
(3)	236.00			487.74	(7)	310.00		363.70	(11)	404.00	342.10
(4)	239.00			377.70	(8)	322.00		367.70	(12)	450.00	340.10
									(13)	500.00	341.12
									(14)	552.00	342.12

MAPA OUTPUT					
POINTS PLOTTED FOR GRAPH, 10,					
CHANNEL CROSS SECTION PLOTS AT STATION					
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	436.00	(5)	251.00	372.48
(2)	71.000	429.00	(6)	266.00	367.48
(3)	236.00	487.57	(7)	318.00	362.48
(4)	239.00	377.48	(8)	322.00	367.48

Table 4.9. Continued.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
INDEX		CHANNEL CROSS SECTION		INDEX		INDEX		INDEX	
HOR. DIST		ELEVATION		HOR. DIST		HOR. DIST		HOR. DIST	
ELEVATION		ELEVATION		ELEVATION		ELEVATION		ELEVATION	
(1)	0.	430.00	(5)	251.00	372.48	(9)	333.00	(9)	352.48
(2)	71.000	428.00	(6)	256.00	367.48	(10)	376.00	(10)	347.48
(3)	235.00	407.57	(7)	310.00	362.48	(11)	404.00	(11)	341.19
(4)	239.00	377.48	(8)	322.00	357.48	(12)	450.00	(12)	339.99
						(13)	500.00	(13)	340.01
						(14)	552.05	(14)	341.01

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
INDEX		CHANNEL CROSS SECTION		INDEX		INDEX		INDEX	
HOR. DIST		ELEVATION		HOR. DIST		HOR. DIST		HOR. DIST	
ELEVATION		ELEVATION		ELEVATION		ELEVATION		ELEVATION	
(1)	0.	430.00	(5)	251.00	372.48	(9)	333.00	(9)	352.48
(2)	71.000	428.00	(6)	256.00	367.48	(10)	376.00	(10)	347.48
(3)	235.00	407.57	(7)	310.00	362.48	(11)	404.00	(11)	341.19
(4)	239.00	377.48	(8)	322.00	357.48	(12)	450.00	(12)	339.99
						(13)	500.00	(13)	339.99
						(14)	552.04	(14)	340.99

Table 4.10. Channel cross section plots at station 7497.6 ft at different times.

MAP OUTPUT											
POINTS PLOTTED FOR GRAPH, 1A.											
CHANNEL CROSS SECTION PLOTS AT STATION											
7497.6 FT DAY 72											
INDEX		MOR. DIST		ELEVATION		INDEX		MOR. DIST		ELEVATION	
(1)	0	439.00	(5)	267.00	374.93	(9)	341.00	354.93			
(2)	75.000	439.00	(6)	278.00	369.93	(10)	353.00	349.93			
(3)	251.00	410.00	(7)	290.00	364.93	(11)	360.00	344.93			
(4)	259.00	379.93	(8)	320.00	359.93	(12)	450.00	349.93			
						(13)	498.00	344.78			
						(14)	549.99	345.78			

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION PLOTS AT STATION					7497.6 FT BAY 144				
INDEX	NOR. DIST	ELEVATION	INDEX	NOR. DIST	ELEVATION	INDEX	NOR. DIST	ELEVATION	ELEVATION
(1)	0	439.00	(5)	267.00	372.20	(9)	341.00	352.20	
(2)	75.000	428.00	(6)	278.00	367.20	(10)	353.00	347.20	
(3)	251.00	407.74	(7)	290.00	362.20	(11)	380.00	348.20	
(4)	250.00	377.20	(8)	320.00	357.20	(12)	450.00	346.94	
						(13)	490.00	341.02	
						(14)	540.00	343.02	

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION PLOTS AT STATION									
ELEVATION		INDEX		HOR. DIST		ELEVATION		INDEX	
HOR. DIST		ELEVATION		HOR. DIST		ELEVATION		HOR. DIST	
(1)	0.	439.00	(5)	267.00	371.20	(9)	341.00	351.20	
(2)	75.000	426.00	(6)	278.00	366.20	(10)	357.00	346.20	
(3)	251.00	407.23	(7)	280.00	361.20	(11)	359.00	341.20	
(4)	259.00	376.20	(8)	389.00	356.20	(12)	458.00	345.60	
						(13)	498.00	340.64	
						(14)	549.97	341.64	

Table 4.10. Continued.

N A P A O U T P U T					
CHANNEL CROSS SECTION PLOTS AT STATION			POINTS PLOTTED FOR GRAPH, 1A.		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	429.00	(5)	287.00	371.19
(2)	75.000	429.00	(6)	278.00	366.19
(3)	251.00	407.23	(7)	259.00	361.19
(4)	259.00	376.19	(8)	329.00	356.19
N A P A O U T P U T					
CHANNEL CROSS SECTION PLOTS AT STATION			POINTS PLOTTED FOR GRAPH, 1A.		
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION
(1)	0.	429.00	(5)	267.00	371.19
(2)	75.000	429.00	(6)	278.00	366.19
(3)	251.00	407.23	(7)	259.00	361.19
(4)	259.00	376.19	(8)	309.00	356.19

Table 4.11. Channel cross section plots at station 7286.4 ft at different times.

[illegible]

Table 4.11. Continued.

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0	439.00	(6)	393.00	359.33	(11)	466.00	344.33	
(2)	79.000	429.00	(7)	313.00	354.33	(12)	459.00	345.33	
(3)	253.00	408.46	(8)	321.00	359.33	(13)	500.00	345.35	
(4)	225.00	379.33	(9)	327.00	354.33	(14)	551.00	345.88	
(5)	236.00	374.33	(10)	350.00	349.33	(15)	599.96	351.86	

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0	439.00	(6)	393.00	359.33	(11)	466.00	344.33	
(2)	79.000	429.00	(7)	313.00	354.33	(12)	459.00	345.35	
(3)	253.00	408.46	(8)	321.00	359.33	(13)	500.00	345.88	
(4)	225.00	379.33	(9)	327.00	354.33	(14)	551.00	351.86	
(5)	236.00	374.33	(10)	350.00	349.33	(15)	599.94	351.86	

Table 4.12. Channel cross section plots at station 7022.4 ft at different times.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0	430.00	(6)	349.00	369.99	(11)	450.00	348.99	(11)
(2)	78.000	420.00	(7)	361.00	364.99	(12)	500.00	348.99	(12)
(3)	226.00	410.00	(8)	373.00	369.99	(13)	533.00	348.99	(13)
(4)	325.00	378.00	(9)	380.00	364.99	(14)	600.00	350.99	(14)
(5)	337.00	374.00	(10)	382.00	340.00	(15)	649.97	349.99	(15)
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0	430.00	(6)	349.00	368.13	(11)	450.00	346.55	(11)
(2)	78.000	420.00	(7)	361.00	363.13	(12)	500.00	348.55	(12)
(3)	226.00	400.21	(8)	373.00	358.13	(13)	533.00	347.55	(13)
(4)	325.00	378.13	(9)	380.00	353.13	(14)	600.00	348.53	(14)
(5)	337.00	373.13	(10)	382.00	348.13	(15)	649.98	347.53	(15)
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0	430.00	(6)	349.00	368.14	(11)	450.00	346.62	(11)
(2)	78.000	420.00	(7)	361.00	363.14	(12)	500.00	346.81	(12)
(3)	226.00	400.21	(8)	373.00	358.14	(13)	533.00	347.81	(13)
(4)	325.00	378.14	(9)	380.00	353.14	(14)	600.00	348.48	(14)
(5)	337.00	373.14	(10)	382.00	348.14	(15)	649.97	347.48	(15)

Table 4.12. Continued.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(6)	349.00	368.14	(11)	450.00	346.62	
(2)	78.000	420.00	(7)	361.00	363.14	(12)	500.00	346.62	
(3)	225.00	408.21	(8)	373.00	358.14	(13)	533.00	347.68	
(4)	325.00	378.14	(9)	389.00	353.14	(14)	600.00	348.48	
(5)	337.00	373.14	(10)	392.00	348.14	(15)	649.94	347.48	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0.	430.00	(6)	349.00	368.14	(11)	450.00	346.62	
(2)	78.000	420.00	(7)	361.00	363.14	(12)	500.00	346.62	
(3)	225.00	408.21	(8)	373.00	358.14	(13)	533.00	347.68	
(4)	325.00	378.14	(9)	389.00	353.14	(14)	600.00	348.48	
(5)	337.00	373.14	(10)	392.00	348.14	(15)	649.94	347.48	

Table 4.13. Channel cross section plots at station 6758.4 ft at different times.

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0	420.00	(6)	331.00	365.03	(11)	500.00	350.13	
(2)	23.000	420.00	(7)	339.00	365.03	(12)	500.00	350.13	
(3)	245.00	388.03	(8)	346.00	365.03	(13)	500.00	351.11	
(4)	315.00	378.03	(9)	402.00	365.03	(14)	500.00	351.01	
(5)	323.00	376.03	(10)	457.00	365.13	(15)	500.00	352.11	
						(16)	702.00	353.01	
N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0	420.00	(6)	331.00	372.31	(11)	500.00	352.08	
(2)	23.000	420.00	(7)	339.00	367.31	(12)	500.00	352.08	
(3)	245.00	387.31	(8)	346.00	362.31	(13)	500.00	353.30	
(4)	315.00	382.31	(9)	402.00	367.31	(14)	500.00	353.00	
(5)	323.00	377.31	(10)	457.00	362.00	(15)	500.00	354.30	
						(16)	702.00	356.00	
N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0	420.00	(6)	331.00	372.91	(11)	500.00	353.28	
(2)	23.000	420.00	(7)	339.00	367.91	(12)	500.00	353.28	
(3)	245.00	387.91	(8)	346.00	362.91	(13)	500.00	354.45	
(4)	315.00	382.91	(9)	402.00	367.91	(14)	500.00	354.95	
(5)	323.00	377.91	(10)	457.00	363.07	(15)	500.00	355.45	
						(16)	702.07	357.15	

Table 4.13. Continued.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(6)	331.00	372.91	(11)	500.00	353.29	
(2)	83.000	429.00	(7)	330.00	367.91	(12)	500.00	353.30	
(3)	245.00	387.91	(8)	345.00	362.91	(13)	500.00	354.46	
(4)	315.00	382.91	(9)	402.00	357.91	(14)	500.00	354.46	
(5)	323.00	377.91	(10)	457.00	353.07	(15)	500.00	355.46	
						(16)	702.94	357.16	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(6)	331.00	372.91	(11)	500.00	353.30	
(2)	83.000	429.00	(7)	330.00	367.91	(12)	500.00	353.30	
(3)	245.00	387.91	(8)	345.00	362.91	(13)	500.00	354.46	
(4)	315.00	382.91	(9)	402.00	357.91	(14)	500.00	354.46	
(5)	323.00	377.91	(10)	457.00	353.07	(15)	500.00	355.46	
						(16)	702.94	357.16	

Table 4.14. Channel cross section plots at station 6494.4 ft at different times.

MAP OUTPUT				POINTS PLOTTED FOR GRAPH, 1A.				6494.4 FT BAY 72			
CHANNEL CROSS SECTION		PLOTS AT STATION		CHANNEL CROSS SECTION		PLOTS AT STATION		CHANNEL CROSS SECTION		PLOTS AT STATION	
INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION
(1)	0.	420.00	(6)	365.00	369.00	(11)	550.00	352.87	(11)	550.00	352.87
(2)	87.000	480.00	(7)	374.00	344.00	(12)	550.00	350.87	(12)	550.00	350.87
(3)	319.00	410.00	(8)	380.00	350.00	(13)	550.00	354.87	(13)	550.00	354.87
(4)	335.00	370.00	(9)	447.00	364.00	(14)	700.00	352.87	(14)	700.00	352.87
(5)	350.00	374.00	(10)	500.00	353.07	(15)	787.00	350.87	(15)	787.00	350.87

MAP OUTPUT				POINTS PLOTTED FOR GRAPH, 1A.				6494.4 FT BAY 144			
CHANNEL CROSS SECTION		PLOTS AT STATION		CHANNEL CROSS SECTION		PLOTS AT STATION		CHANNEL CROSS SECTION		PLOTS AT STATION	
INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION
(1)	0.	420.00	(6)	365.00	367.84	(11)	550.00	350.76	(11)	550.00	350.76
(2)	87.000	480.00	(7)	374.00	352.04	(12)	550.00	348.76	(12)	550.00	348.76
(3)	319.00	407.07	(8)	380.00	367.04	(13)	550.00	352.64	(13)	550.00	352.64
(4)	335.00	377.04	(9)	447.00	352.04	(14)	700.00	350.64	(14)	700.00	350.64
(5)	350.00	370.04	(10)	500.00	351.76	(15)	787.00	350.64	(15)	787.00	350.64

MAP OUTPUT				POINTS PLOTTED FOR GRAPH, 1A.				6494.4 FT BAY 216			
CHANNEL CROSS SECTION		PLOTS AT STATION		CHANNEL CROSS SECTION		PLOTS AT STATION		CHANNEL CROSS SECTION		PLOTS AT STATION	
INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION	INDEX	MOR. DIST	ELEVATION
(1)	0.	420.00	(6)	365.00	367.81	(11)	550.00	351.16	(11)	550.00	351.16
(2)	87.000	480.00	(7)	374.00	362.81	(12)	550.00	349.16	(12)	550.00	349.16
(3)	319.00	407.00	(8)	380.00	367.81	(13)	550.00	352.95	(13)	550.00	352.95
(4)	335.00	377.81	(9)	447.00	362.81	(14)	700.00	350.95	(14)	700.00	350.95
(5)	350.00	370.81	(10)	500.00	362.16	(15)	787.07	350.95	(15)	787.07	350.95

Table 4.14. Continued.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 10.					6484.4 FT DAY 288				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0.	439.00	(6)	355.00	357.81	(11)	550.00	351.17	
(2)	87.000	429.00	(7)	374.00	352.81	(12)	550.00	349.17	
(3)	219.00	407.82	(8)	385.00	357.81	(13)	550.00	352.95	
(4)	325.00	377.81	(9)	447.00	358.81	(14)	700.00	350.95	
(5)	350.00	372.81	(10)	500.00	358.17	(15)	727.95	350.95	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 10.					6484.4 FT DAY 289				
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX
(1)	0.	439.00	(6)	355.00	357.81	(11)	550.00	351.17	
(2)	87.000	429.00	(7)	374.00	352.81	(12)	550.00	349.17	
(3)	219.00	407.82	(8)	385.00	357.81	(13)	550.00	352.95	
(4)	325.00	377.81	(9)	447.00	358.81	(14)	700.00	350.95	
(5)	350.00	372.81	(10)	500.00	358.17	(15)	727.94	350.95	

Table 4.15. Channel cross section plots at station 6177.6 ft at different times.

[illegible]

Table 4.15. Continued.

N A P A O U T P U T									
		CHANNEL CROSS SECTION		POINTS PLOTTED FOR GRAPH, 1A.		6177.6 FT DAY 288			
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0	430.00	(1)	373.00	359.28	(1)	550.00	352.74	
(2)	86.000	420.00	(7)	368.00	354.22	(12)	500.00	352.76	
(3)	377.00	400.23	(8)	416.00	359.28	(13)	500.00	351.38	
(4)	341.00	378.23	(9)	478.00	354.22	(14)	700.00	351.30	
(5)	381.00	374.23	(10)	500.00	354.22	(15)	749.00	350.30	

N A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION			H M O S T A T I O N			6177.6 FT DAY 360			ELEVATION
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	439.00	(6)	373.00	369.28	(11)	550.00	352.74	
(2)	86.000	428.00	(7)	388.00	354.28	(12)	600.00	352.76	
(3)	337.00	409.23	(8)	415.00	359.28	(13)	650.00	351.30	
(4)	379.28	379.28	(9)	478.00	364.28	(14)	700.00	351.30	
(5)	381.00	374.28	(10)	500.00	364.28	(15)	749.94	359.30	

Table 4.16. Channel cross section plots at station 5808.0 ft at different times.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,				5808.0 FT DAY 72					
CHANNEL CROSS SECTION PLOTS AT STATION		INDEX		HOR. DIST		INDEX		HOR. DIST	
INDEX	HOR. DIST	ELEVATION							ELEVATION
(1)	0.	430.00	(5)	417.00		(9)	531.00		354.04
(2)	91.000	420.00	(6)	443.00		(10)	614.00		351.10
(3)	366.00	410.00	(7)	474.00		(11)	717.00		353.63
(4)	374.00	379.04	(8)	512.00		(12)	822.99		354.78
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,				5808.0 FT DAY 144					
CHANNEL CROSS SECTION PLOTS AT STATION		INDEX		HOR. DIST		INDEX		HOR. DIST	
INDEX	HOR. DIST	ELEVATION							ELEVATION
(1)	0.	430.00	(5)	417.00		(9)	531.00		354.78
(2)	91.000	420.00	(6)	443.00		(10)	614.00		352.08
(3)	366.00	411.00	(7)	474.00		(11)	717.00		354.99
(4)	374.00	379.78	(8)	512.00		(12)	822.98		356.16
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,				5808.0 FT DAY 216					
CHANNEL CROSS SECTION PLOTS AT STATION		INDEX		HOR. DIST		INDEX		HOR. DIST	
INDEX	HOR. DIST	ELEVATION							ELEVATION
(1)	0.	430.00	(5)	417.00		(9)	531.00		354.83
(2)	91.000	420.00	(6)	443.00		(10)	614.00		352.05
(3)	366.00	411.00	(7)	474.00		(11)	717.00		355.13
(4)	374.00	379.83	(8)	512.00		(12)	822.97		356.30

Table 4.16. Continued.

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION		PLOTS AT STATION		ELEVATION		5808.0 FT DAY 288			
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0	430.00	(5)	417.00	374.83	(9)	531.00	354.83	
(2)	91.000	420.00	(6)	443.00	369.83	(10)	614.00	352.05	
(3)	366.00	411.00	(7)	474.00	364.83	(11)	717.00	355.14	
(4)	374.00	370.83	(8)	512.00	359.83	(12)	822.05	356.30	

M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION		PLOTS AT STATION		ELEVATION		5808.0 FT DAY 360			
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	
(1)	0	430.00	(5)	417.00	374.83	(9)	531.00	354.83	
(2)	91.000	420.00	(6)	443.00	369.83	(10)	614.00	352.05	
(3)	366.00	411.00	(7)	474.00	364.83	(11)	717.00	355.14	
(4)	374.00	370.83	(8)	512.00	359.83	(12)	822.94	356.30	

Table 4.17. Channel cross section plots at station 5280 ft at different times.

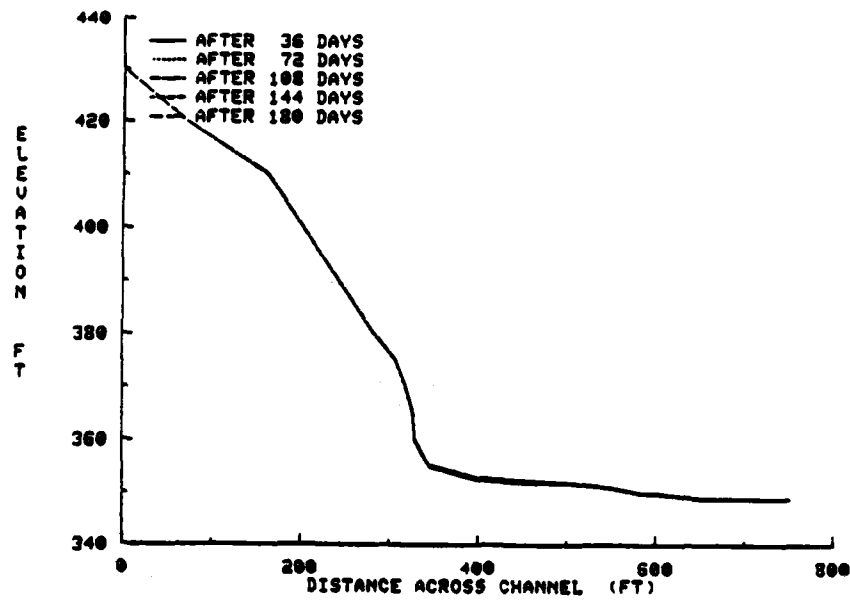
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(6)	424.00	391.45	5280.0 FT DAY 72			
(2)	50.000	420.00	(7)	455.00	385.45	INDEX	HOR. DIST		
(3)	270.00	410.00	(8)	515.00	380.45	(11)	727.00		360.84
(4)	350.00	405.00	(9)	575.00	370.45	(12)	788.00		362.84
(5)	400.00	390.47	(10)	647.00	359.45	(13)	848.00		365.21
						(14)	894.00		368.21
						(15)	970.00		370.21
						(16)	1015.0		373.23
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(6)	424.00	399.65	5280.0 FT DAY 144			
(2)	50.000	420.00	(7)	455.00	384.65	INDEX	HOR. DIST		
(3)	270.00	409.76	(8)	515.00	378.65	(11)	727.00		360.88
(4)	350.00	405.35	(9)	575.00	369.65	(12)	788.00		362.88
(5)	400.00	398.63	(10)	647.00	359.35	(13)	848.00		365.38
						(14)	894.00		368.38
						(15)	970.00		370.38
						(16)	1015.0		373.40
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A,									
CHANNEL CROSS SECTION PLOTS AT STATION									
INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	INDEX	HOR. DIST	ELEVATION	ELEVATION
(1)	0.	430.00	(6)	424.00	392.65	5280.0 FT DAY 216			
(2)	50.000	420.00	(7)	455.00	384.65	INDEX	HOR. DIST		
(3)	270.00	409.76	(8)	515.00	378.65	(11)	727.00		360.92
(4)	350.00	405.35	(9)	575.00	369.65	(12)	788.00		362.92
(5)	400.00	398.67	(10)	647.00	359.37	(13)	848.00		365.44
						(14)	894.00		368.44
						(15)	970.00		370.44
						(16)	1015.0		373.46

Table 4.17. Continued.

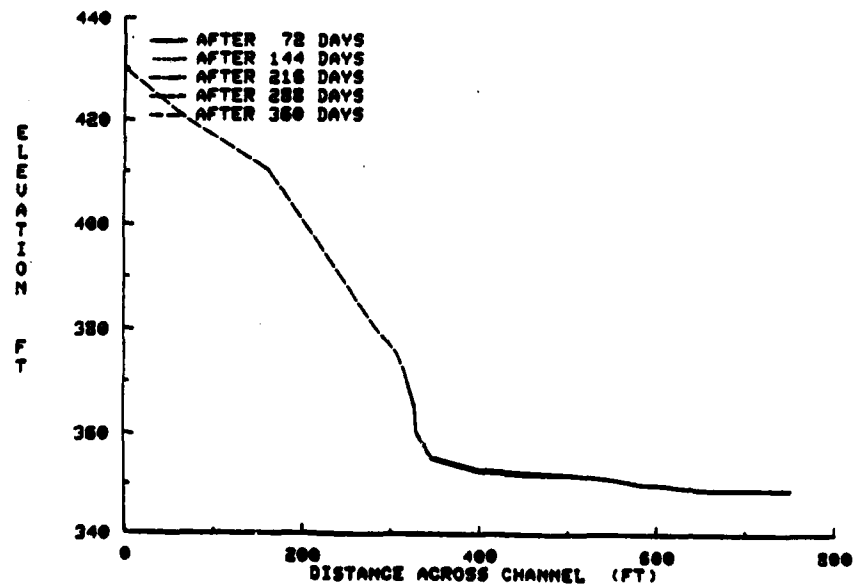
M A P A O U T P U T									
POINTS PLOTTED FOR GRAPH, 1A.									
CHANNEL CROSS SECTION		POINTS PLOTTED FOR GRAPH, 1A.		CHANNEL CROSS SECTION		POINTS PLOTTED FOR GRAPH, 1A.		CHANNEL CROSS SECTION	
ELEVATION		ELEVATION		ELEVATION		ELEVATION		ELEVATION	
INDEX	HOR. DIST	INDEX	HOR. DIST	INDEX	HOR. DIST	INDEX	HOR. DIST	INDEX	HOR. DIST
(1)	0.	(1)	0.	(1)	0.	(1)	0.	(1)	0.
(2)	50.00	(2)	50.00	(2)	50.00	(2)	50.00	(2)	50.00
(3)	270.00	(3)	270.00	(3)	270.00	(3)	270.00	(3)	270.00
(4)	350.00	(4)	350.00	(4)	350.00	(4)	350.00	(4)	350.00
(5)	400.00	(5)	400.00	(5)	400.00	(5)	400.00	(5)	400.00
(6)	420.00	(6)	420.00	(6)	420.00	(6)	420.00	(6)	420.00
(7)	455.00	(7)	455.00	(7)	455.00	(7)	455.00	(7)	455.00
(8)	515.00	(8)	515.00	(8)	515.00	(8)	515.00	(8)	515.00
(9)	575.00	(9)	575.00	(9)	575.00	(9)	575.00	(9)	575.00
(10)	657.00	(10)	657.00	(10)	657.00	(10)	657.00	(10)	657.00
(11)	727.00	(11)	727.00	(11)	727.00	(11)	727.00	(11)	727.00
(12)	788.00	(12)	788.00	(12)	788.00	(12)	788.00	(12)	788.00
(13)	848.00	(13)	848.00	(13)	848.00	(13)	848.00	(13)	848.00
(14)	894.00	(14)	894.00	(14)	894.00	(14)	894.00	(14)	894.00
(15)	970.00	(15)	970.00	(15)	970.00	(15)	970.00	(15)	970.00
(16)	1015.0	(16)	1015.0	(16)	1015.0	(16)	1015.0	(16)	1015.0
(17)	360.92	(17)	360.92	(17)	360.92	(17)	360.92	(17)	360.92
(18)	362.92	(18)	362.92	(18)	362.92	(18)	362.92	(18)	362.92
(19)	365.44	(19)	365.44	(19)	365.44	(19)	365.44	(19)	365.44
(20)	368.44	(20)	368.44	(20)	368.44	(20)	368.44	(20)	368.44
(21)	370.44	(21)	370.44	(21)	370.44	(21)	370.44	(21)	370.44
(22)	373.46	(22)	373.46	(22)	373.46	(22)	373.46	(22)	373.46

Table 4.18. Channel cross section plots at station 3960 ft at different times.

N A P A O U T P U T										
POINTS PLOTTED FOR GRAPH, 1A,										
CHANNEL CROSS SECTION PLOTS AT STATION										
INDEX	NOR. DIST	ELEVATION	INDEX	NOR. DIST	ELEVATION	INDEX	NOR. DIST	ELEVATION	INDEX	
(1)	0.	420.00	(6)	520.00	404.00	(11)	871.00	368.03	(16)	1258.00
(2)	20.000	420.00	(7)	591.00	385.01	(12)	939.00	369.45	(17)	1258.00
(3)	270.00	418.00	(8)	636.00	383.01	(13)	1023.00	369.42	(18)	1258.00
(4)	350.00	408.00	(9)	712.00	363.01	(14)	1106.00	370.48	(19)	1258.00
(5)	400.00	400.00	(10)	803.00	366.01	(15)	1182.00	373.06	(20)	1258.00
						(16)	1258.00	374.04		
N A P A O U T P U T										
POINTS PLOTTED FOR GRAPH, 1A,										
CHANNEL CROSS SECTION PLOTS AT STATION										
INDEX	NOR. DIST	ELEVATION	INDEX	NOR. DIST	ELEVATION	INDEX	NOR. DIST	ELEVATION	INDEX	
(1)	0.	420.00	(6)	520.00	403.02	(11)	871.00	367.45	(16)	1258.00
(2)	20.000	420.00	(7)	591.00	385.01	(12)	939.00	369.45	(17)	1258.00
(3)	270.00	409.15	(8)	636.00	382.01	(13)	1023.00	369.42	(18)	1258.00
(4)	350.00	405.02	(9)	712.00	362.01	(14)	1106.00	370.48	(19)	1258.00
(5)	400.00	404.03	(10)	803.00	366.44	(15)	1182.00	373.42	(20)	1258.00
						(16)	1258.00	373.41		
N A P A O U T P U T										
POINTS PLOTTED FOR GRAPH, 1A,										
CHANNEL CROSS SECTION PLOTS AT STATION										
INDEX	NOR. DIST	ELEVATION	INDEX	NOR. DIST	ELEVATION	INDEX	NOR. DIST	ELEVATION	INDEX	
(1)	0.	420.00	(6)	520.00	403.03	(11)	871.00	367.55	(16)	1258.00
(2)	20.000	420.00	(7)	591.00	385.03	(12)	939.00	369.55	(17)	1258.00
(3)	270.00	409.15	(8)	636.00	382.03	(13)	1023.00	369.48	(18)	1258.00
(4)	350.00	405.03	(9)	712.00	362.03	(14)	1106.00	370.48	(19)	1258.00
(5)	400.00	404.03	(10)	803.00	366.45	(15)	1182.00	373.48	(20)	1258.00
						(16)	1258.00	373.47		

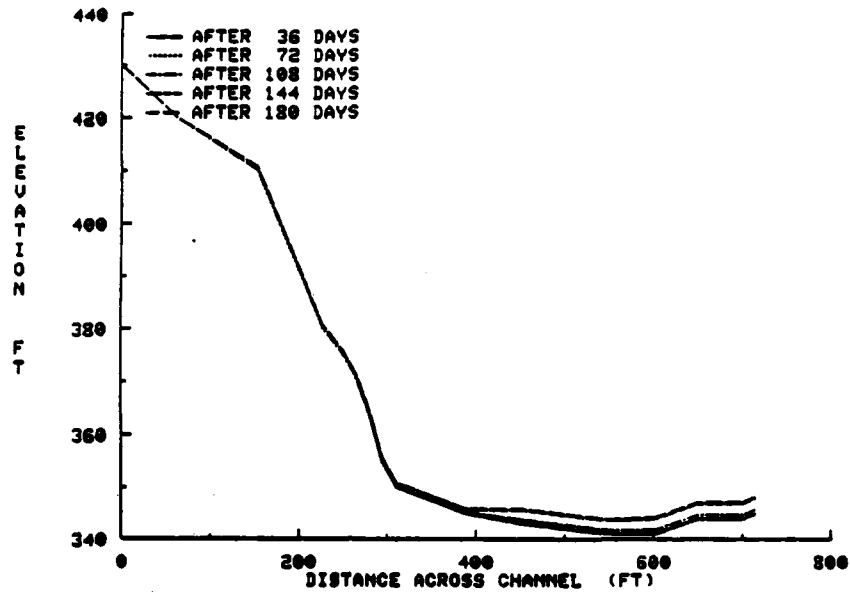


(a)

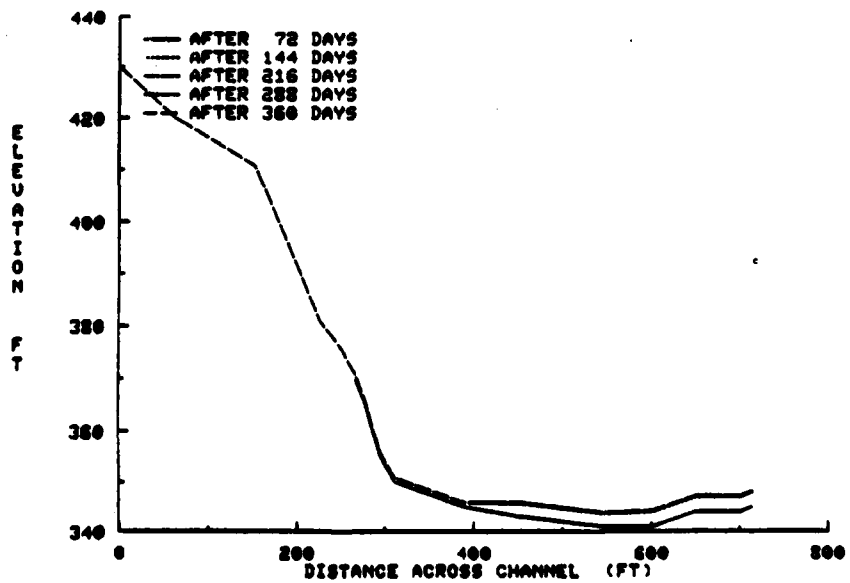


(b)

Figure 4.7. Channel cross section plots at station 8764.8 ft.

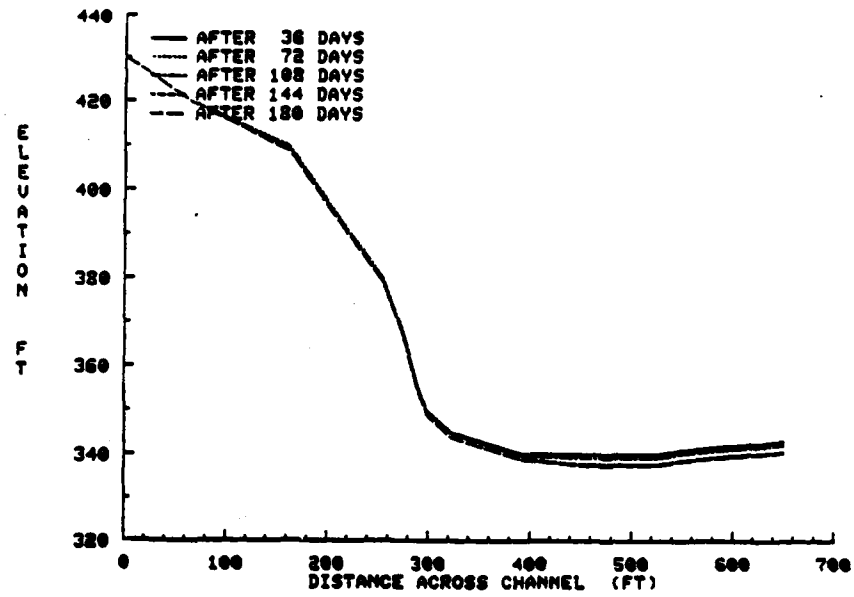


(a)

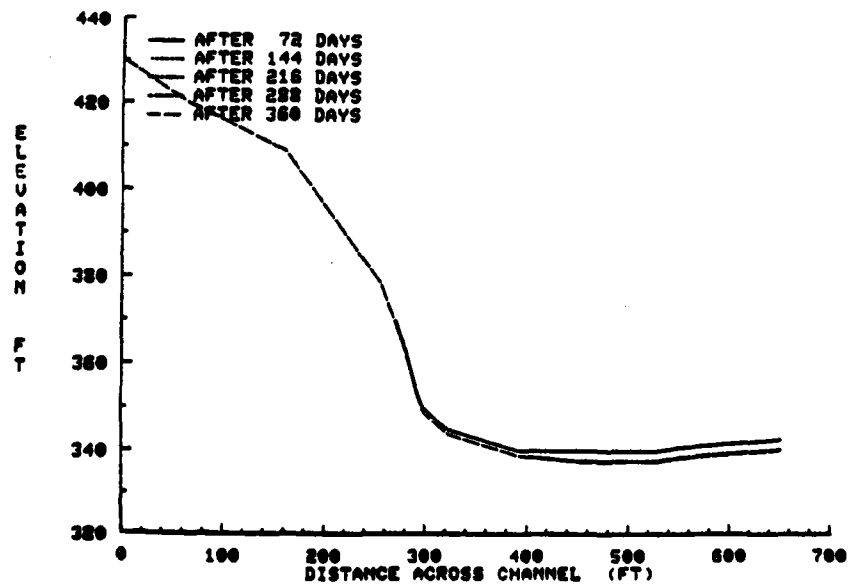


(b)

Figure 4.8. Channel cross section plots at station 8553.6 ft.

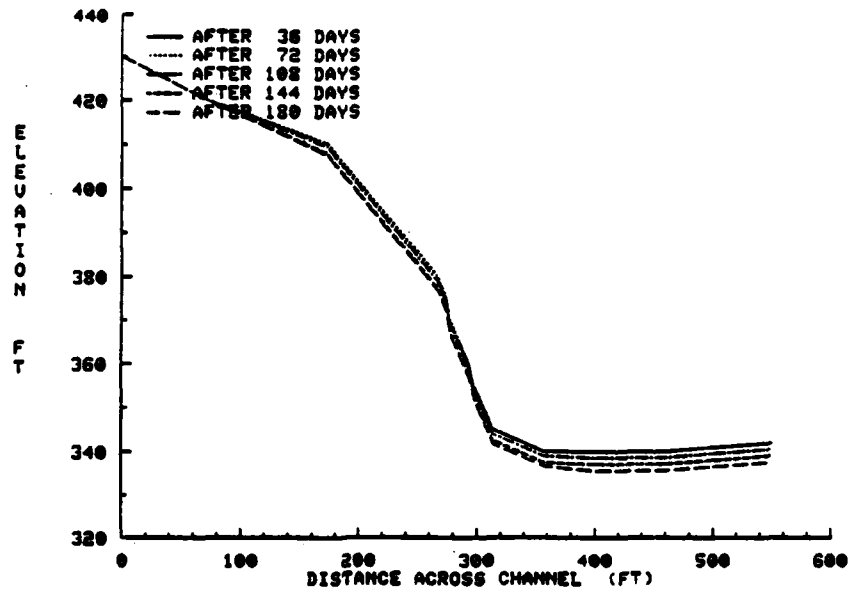


(a)

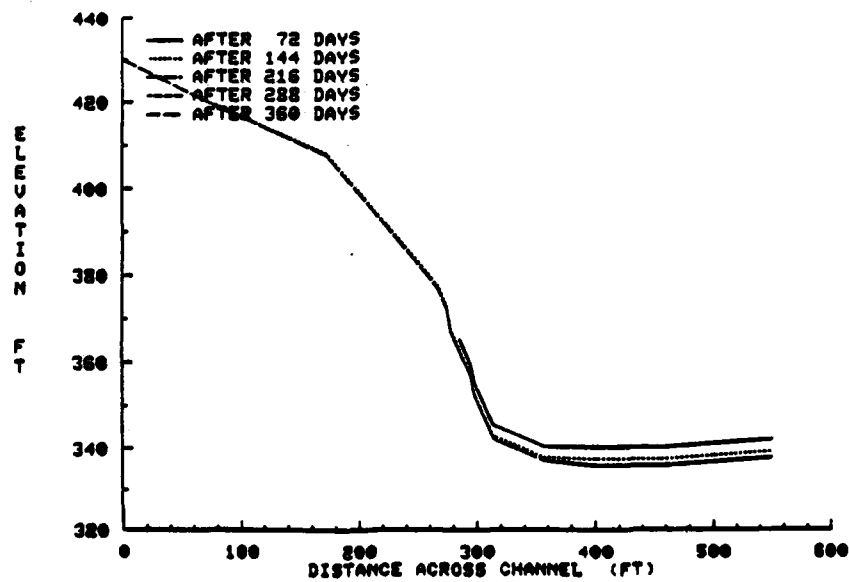


(b)

Figure 4.9. Channel cross section plots at station 8448.0 ft.

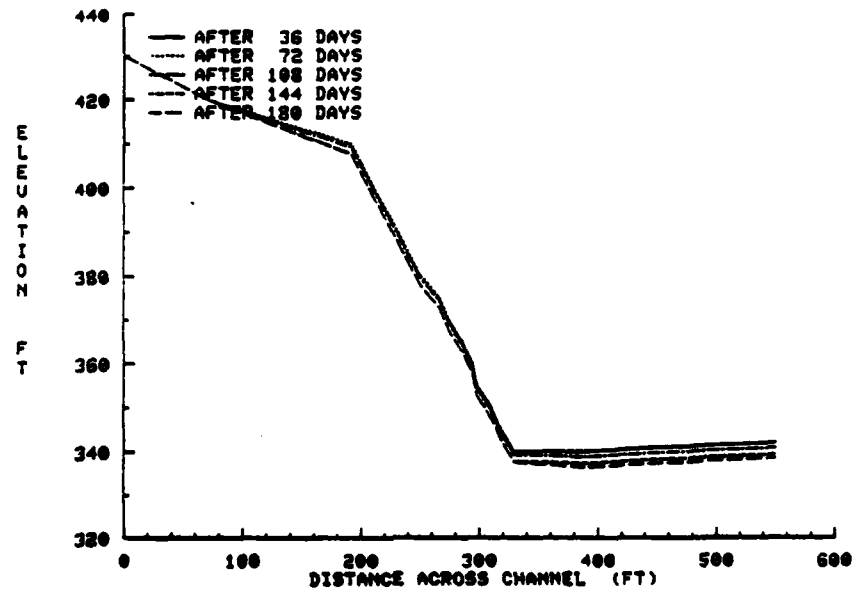


(a)

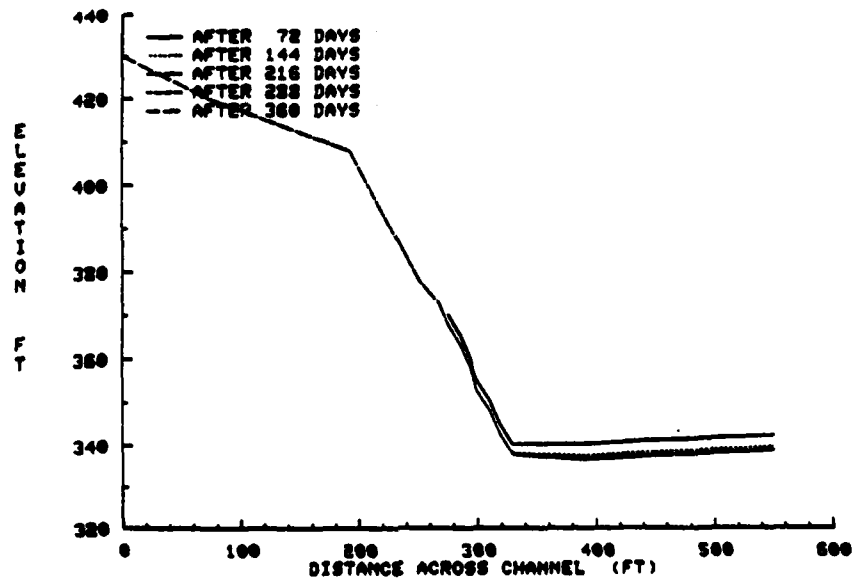


(b)

Figure 4.10. Channel cross section plots at station 8342.4 ft.

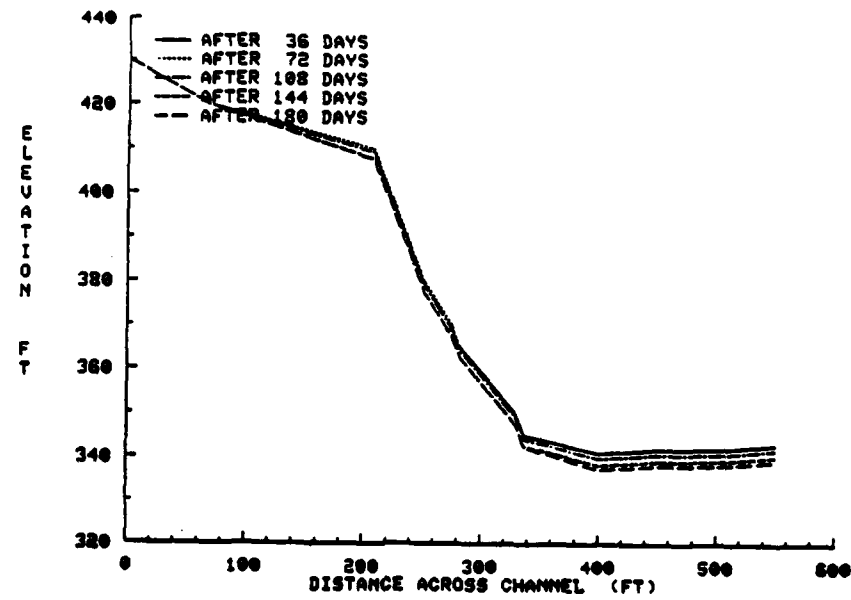


(a)

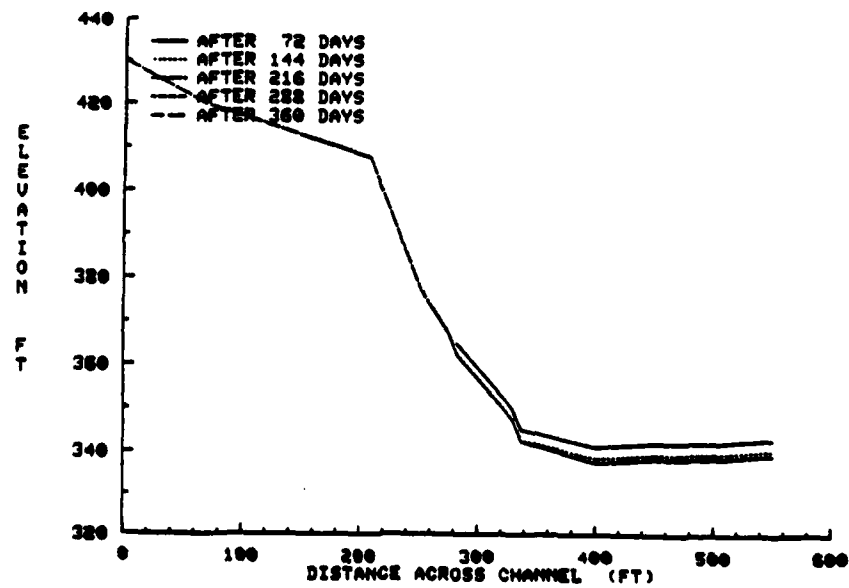


(b)

Figure 4.11. Channel cross section plots at station 8184.0 ft.

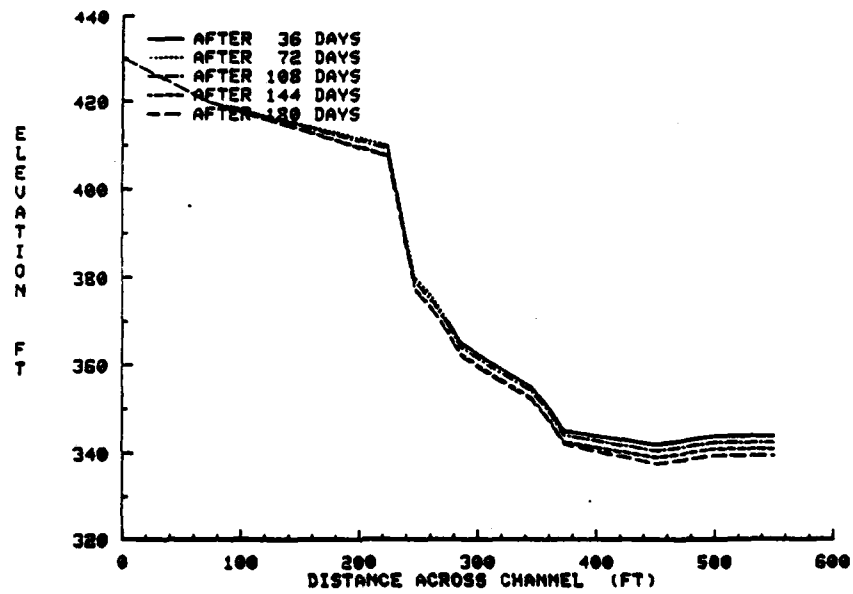


(a)

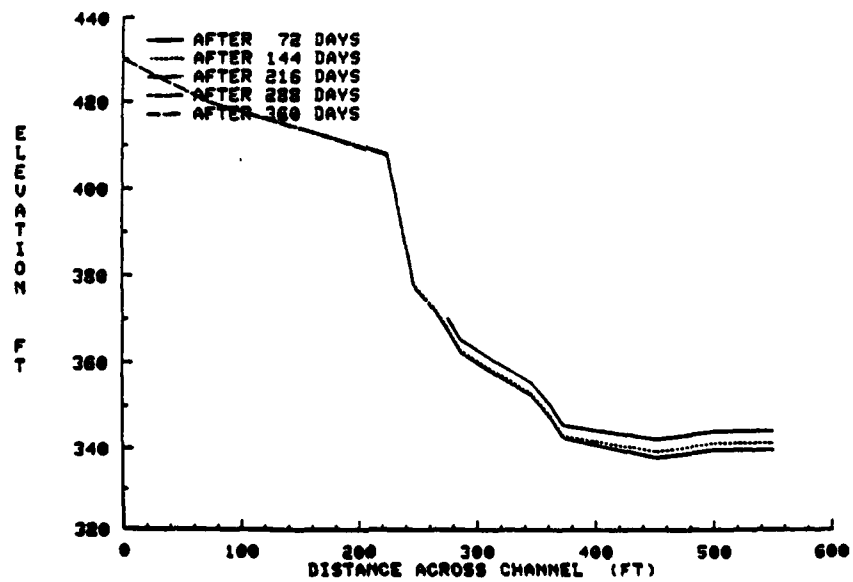


(b)

Figure 4.12. Channel cross section plots at station 8025.6 ft.

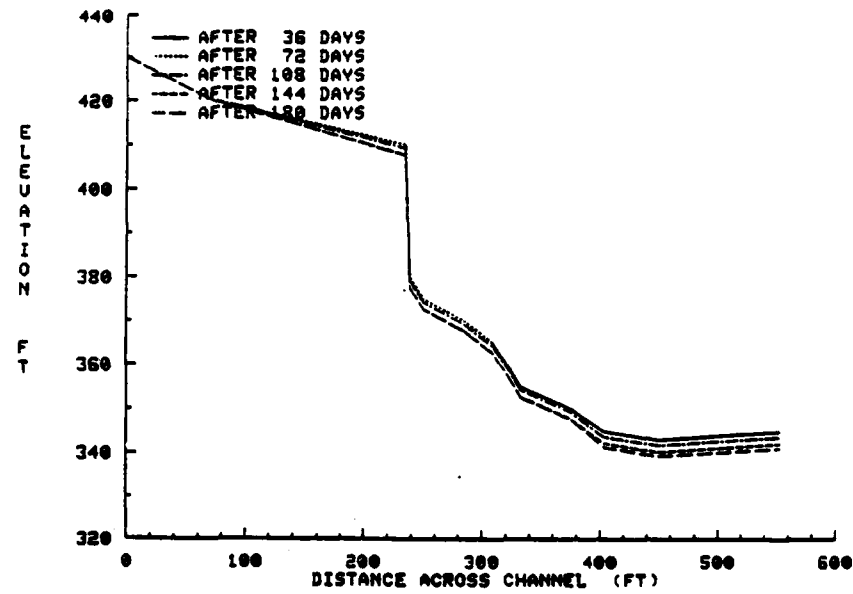


(a)

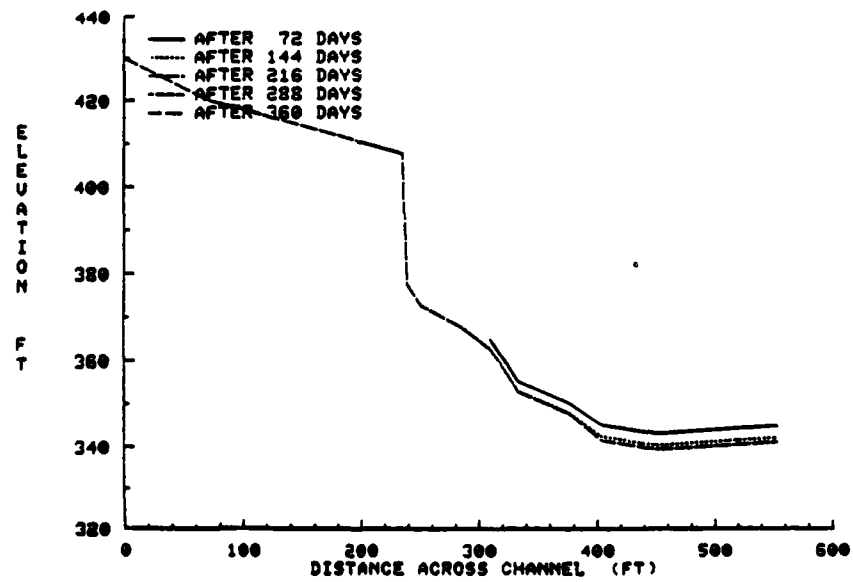


(b)

Figure 4.13. Channel cross section plots at station 7867.2 ft.



(a)



(b)

Figure 4.14. Channel cross section plots at station 7708.8 ft.

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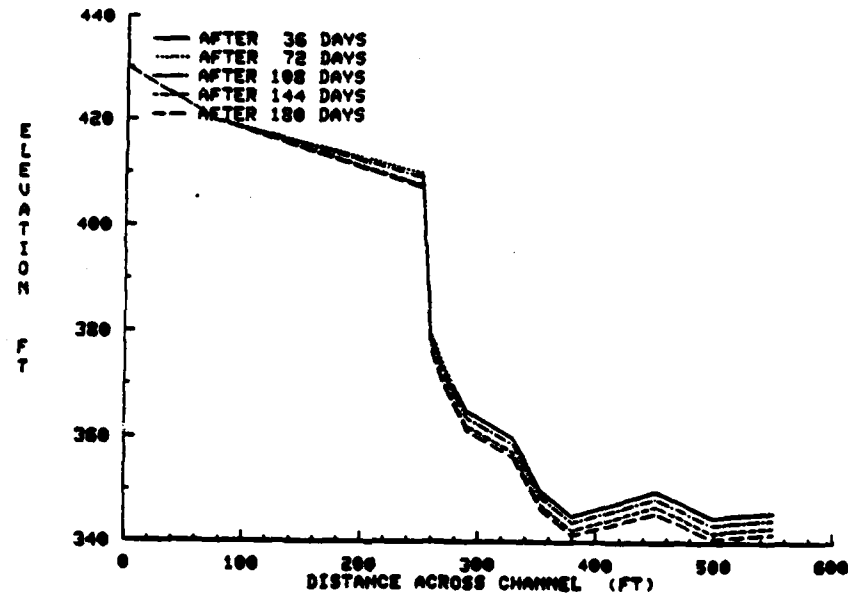
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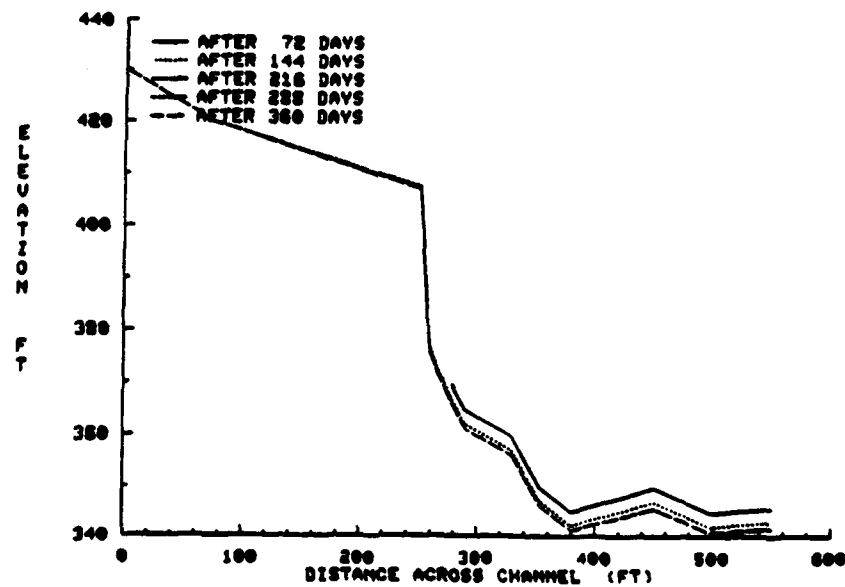
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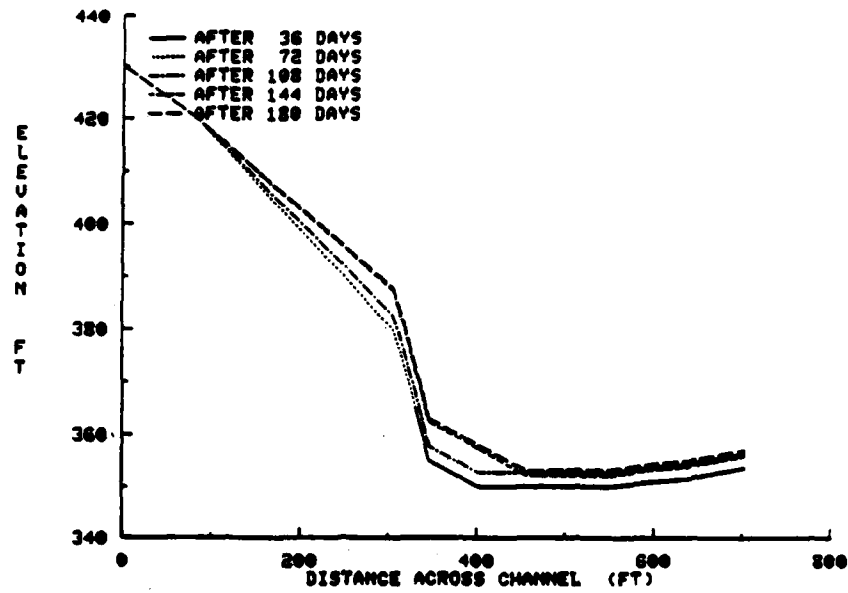


(a)

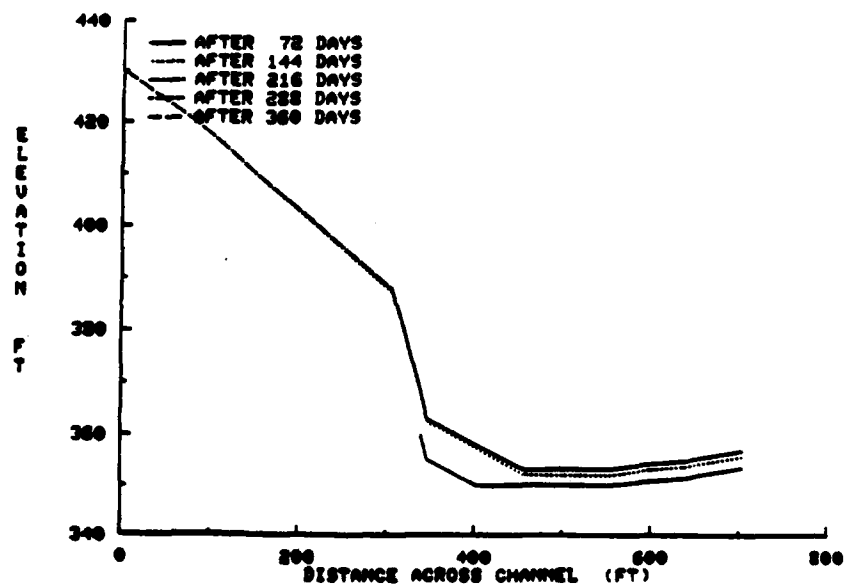


(b)

Figure 4.15. Channel cross section plots at station 7497.6 ft.

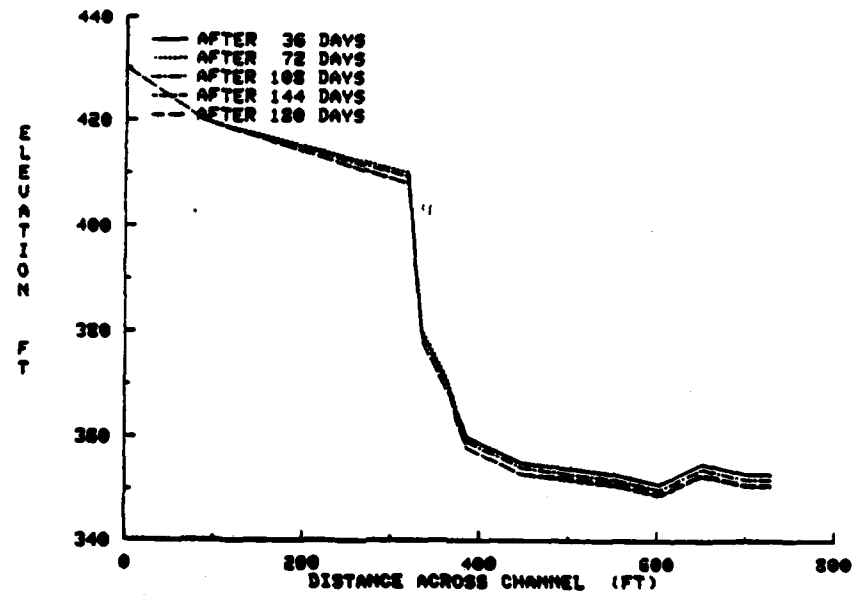


(a)

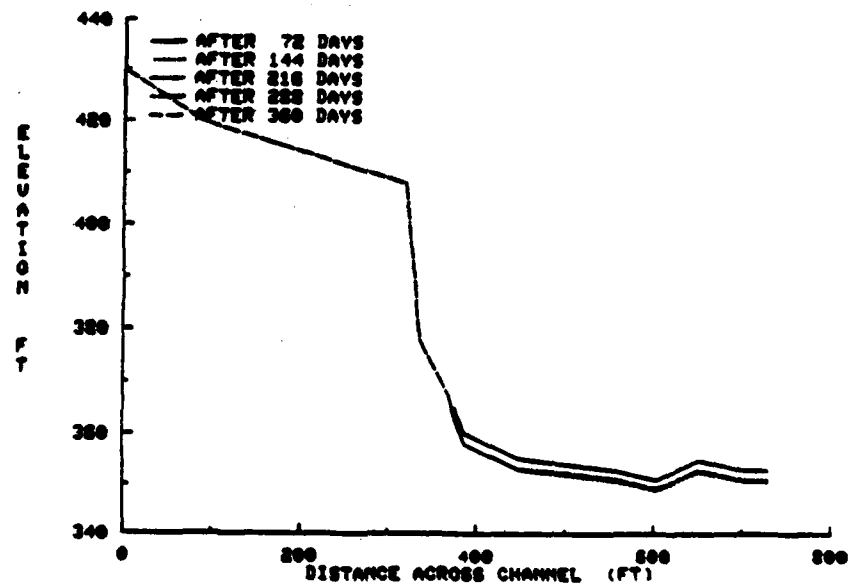


(b)

Figure 4.16. Channel cross section plots at station 6758.4 ft.

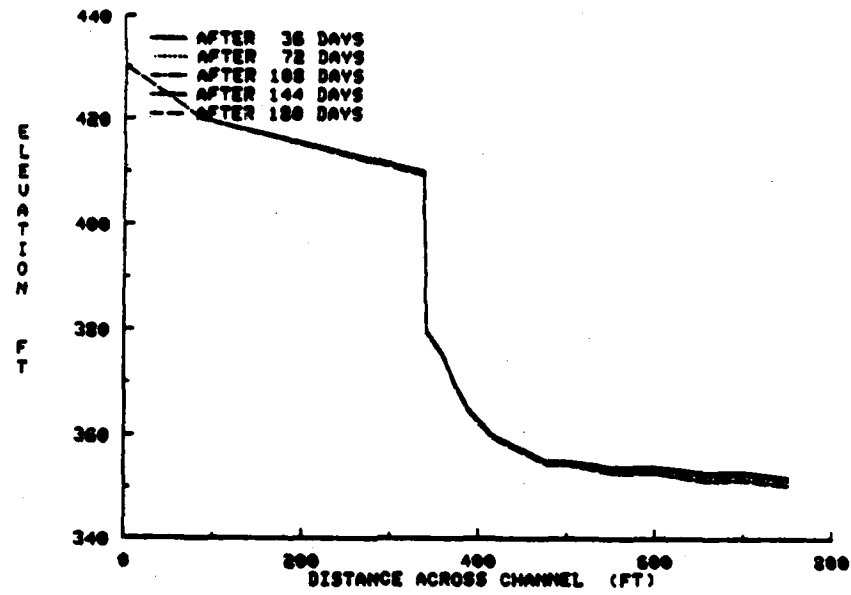


(a)

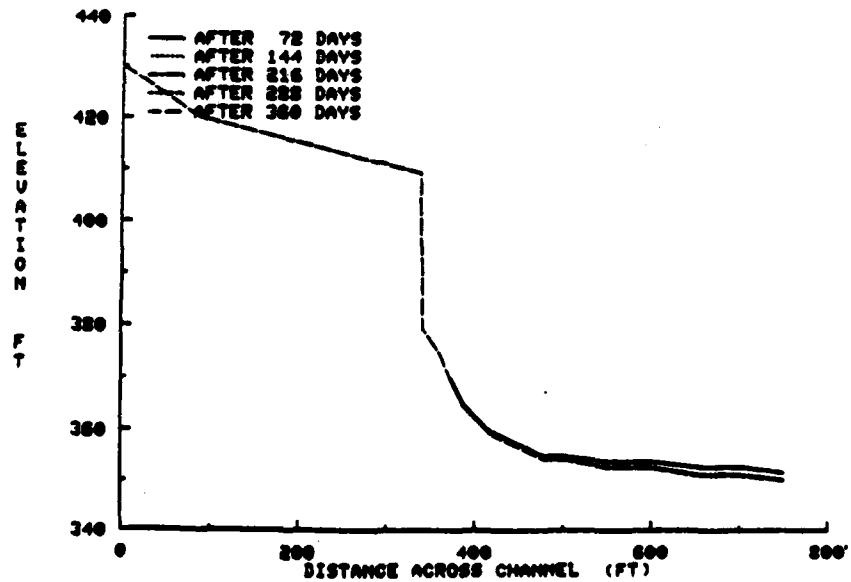


(b)

Figure 4.17. Channel cross section plots at station 6494.4 ft.

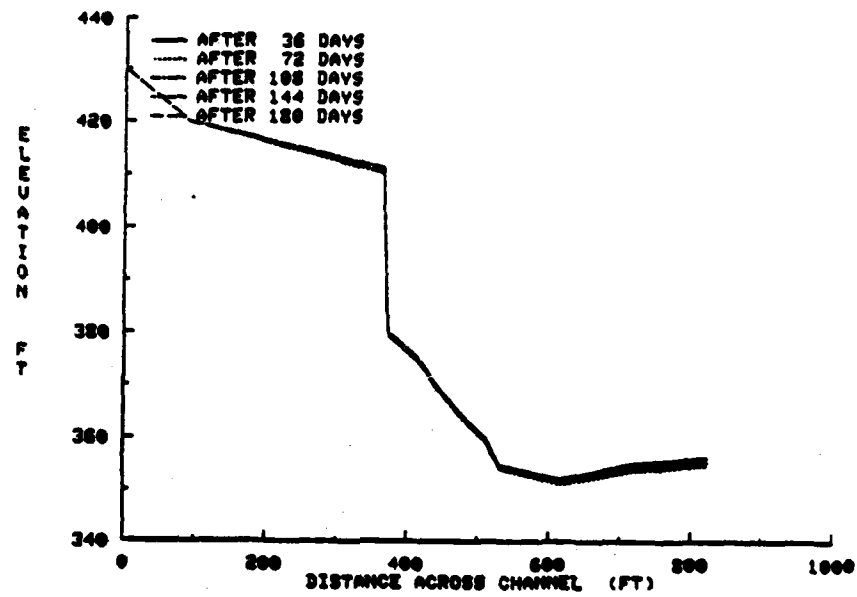


(a)

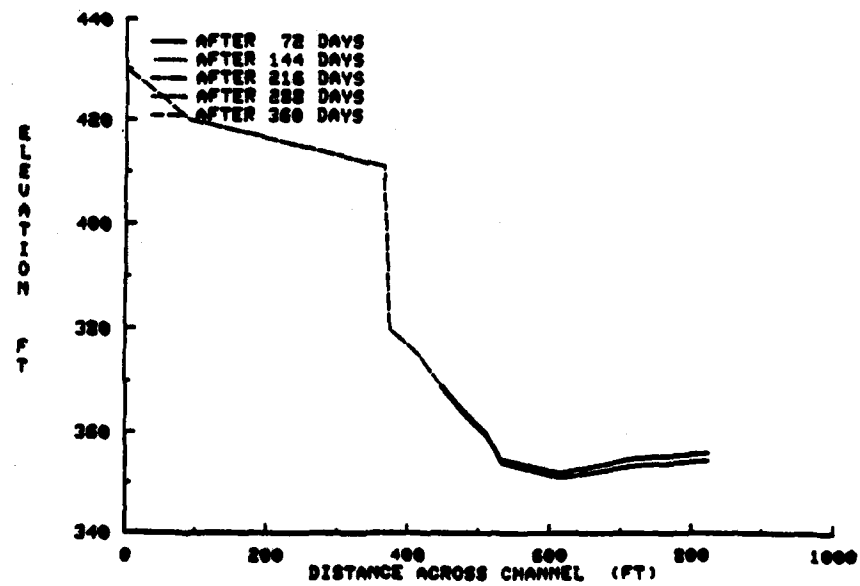


(b)

Figure 4.18. Channel cross section plots at station 6177.6 ft.

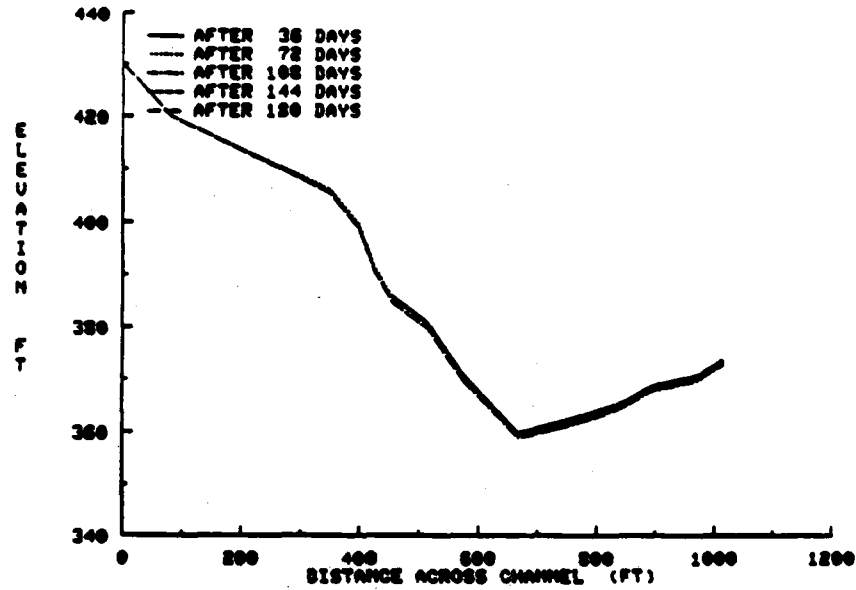


(a)

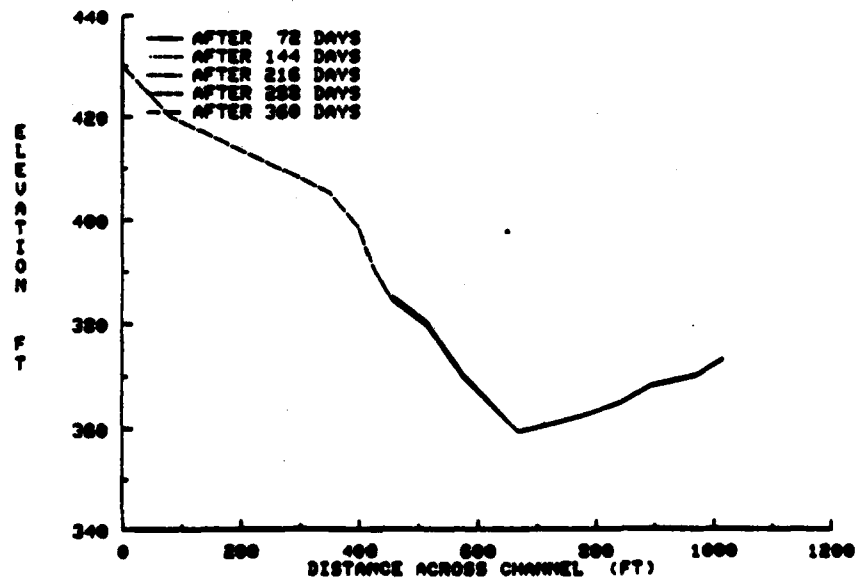


(b)

Figure 4.19. Channel cross section plots at station 5808.0 ft.

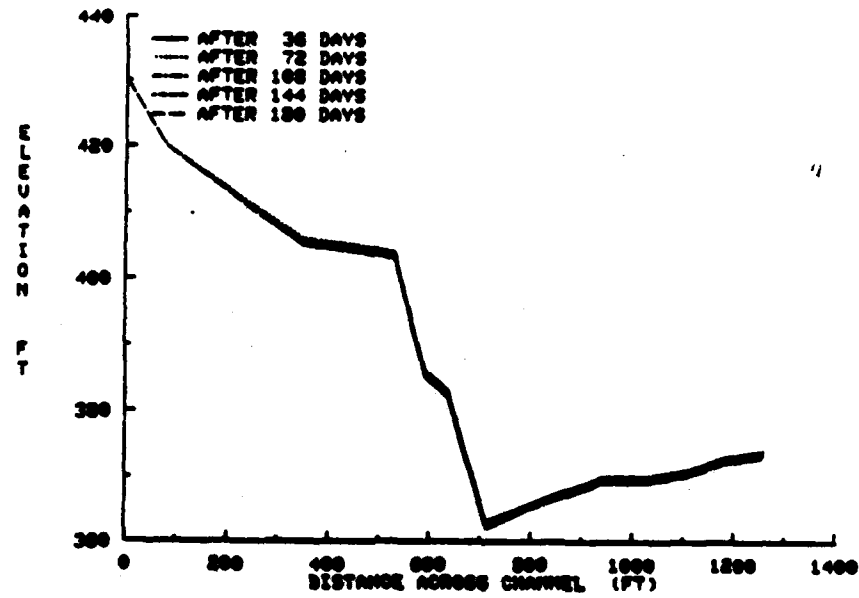


(a)

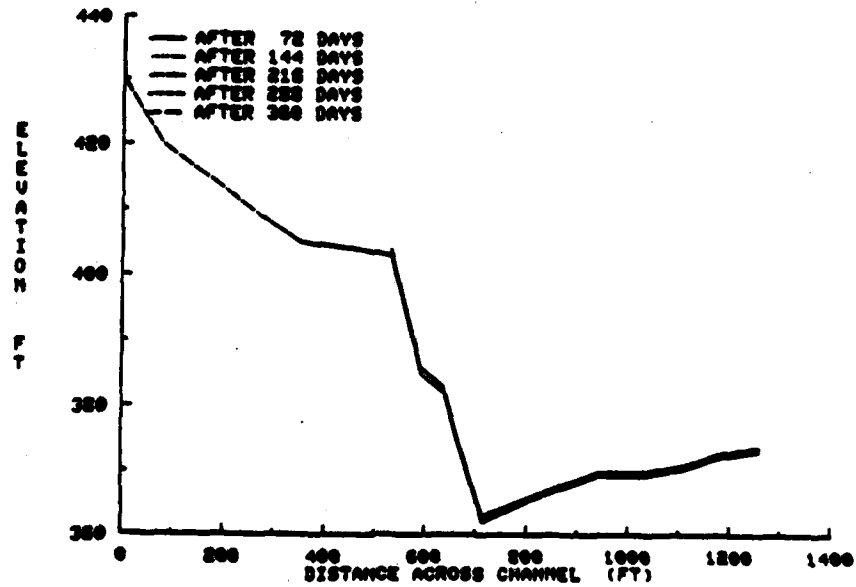


(b)

Figure 4.20. Channel cross section plots at station 5280.0 ft.



(a)



(b)

Figure 4.21. Channel cross section plots at station 3960.0 ft.

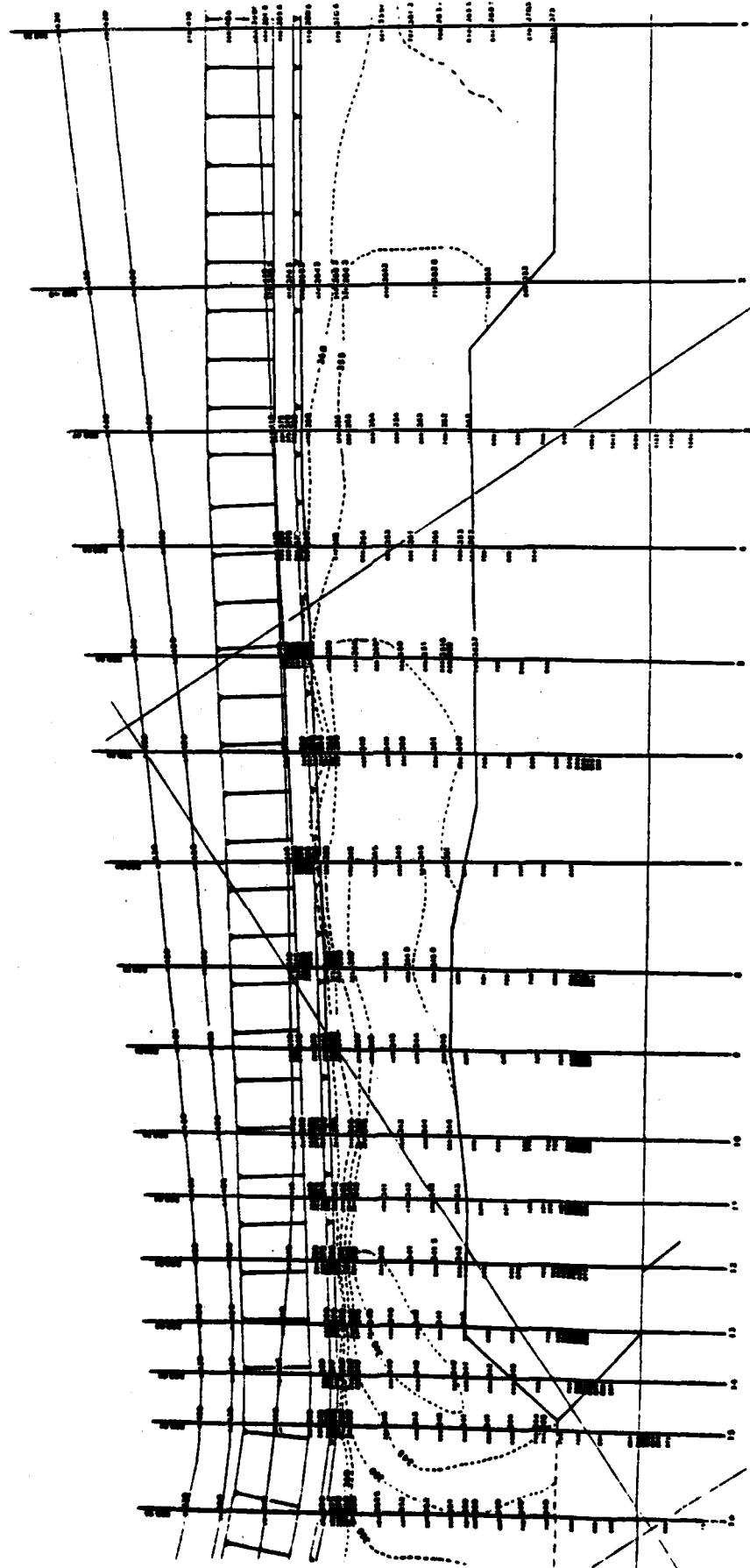


Figure 4.22. Computed contour lines (60 days later).

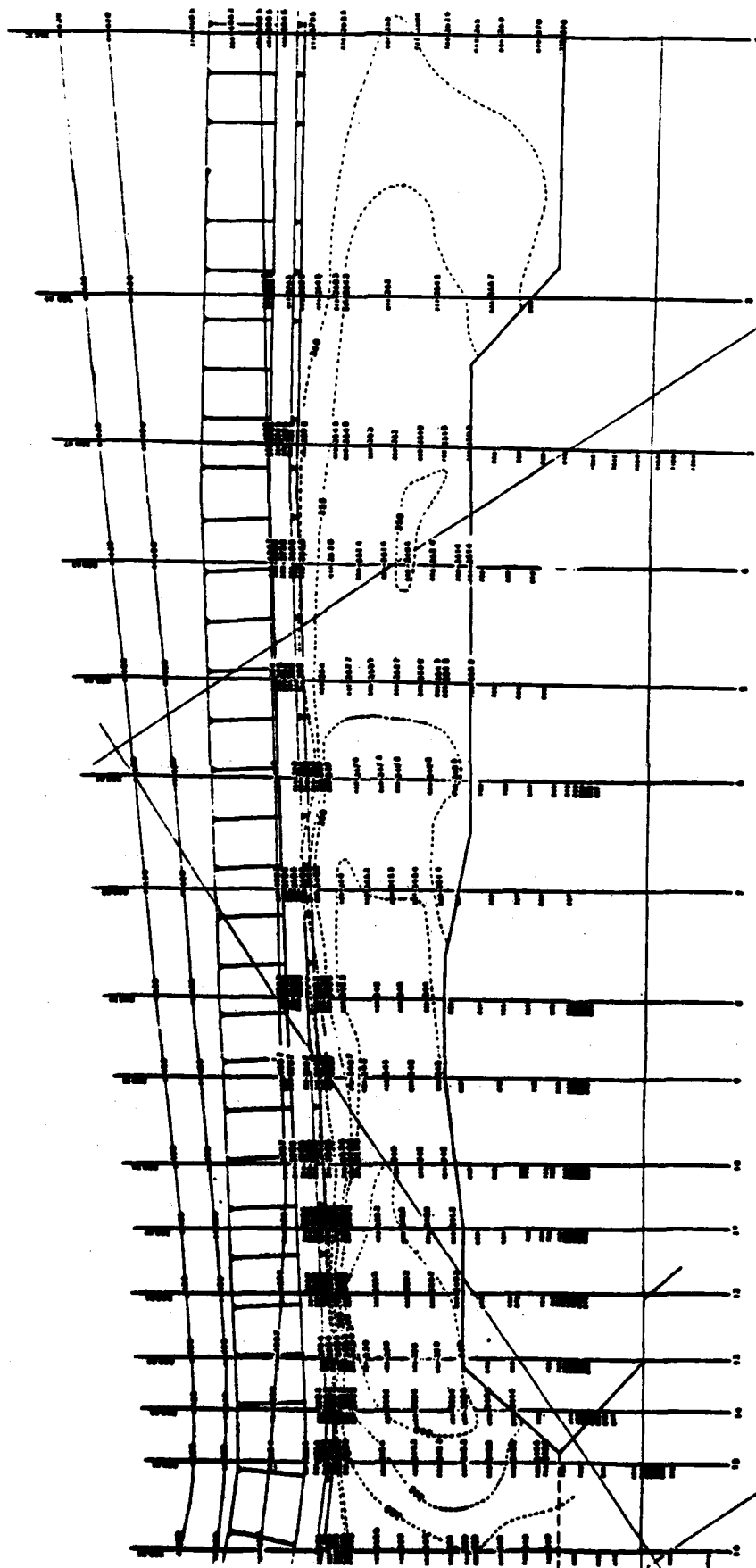


Figure 4.23. Computed contour lines (120 days later).

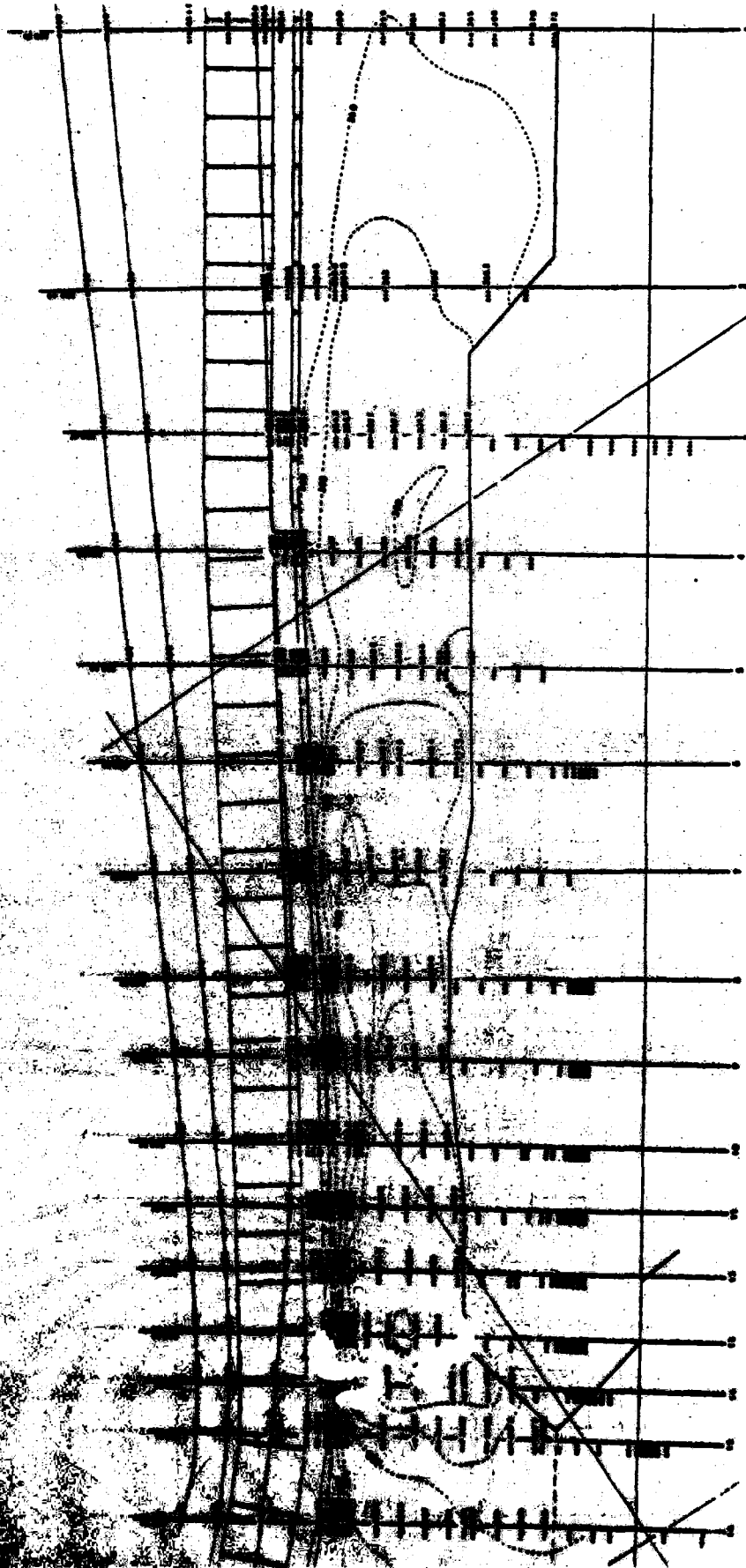


Figure 4.24. Computed contour lines (180 days later).

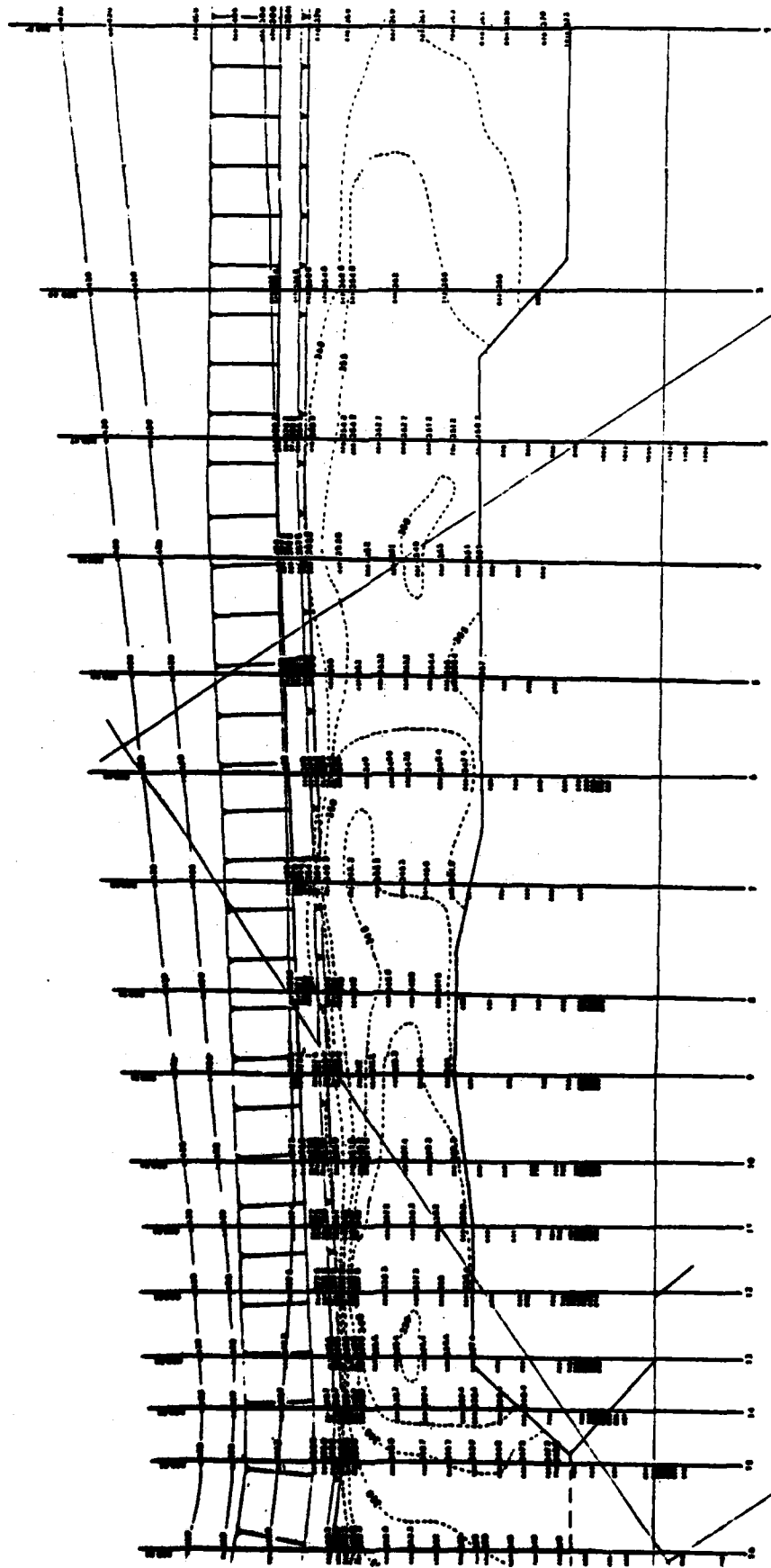


Figure 4.25. Computed contour lines (240 days later).

Figure 4.26. Computed contour lines (312 days later).

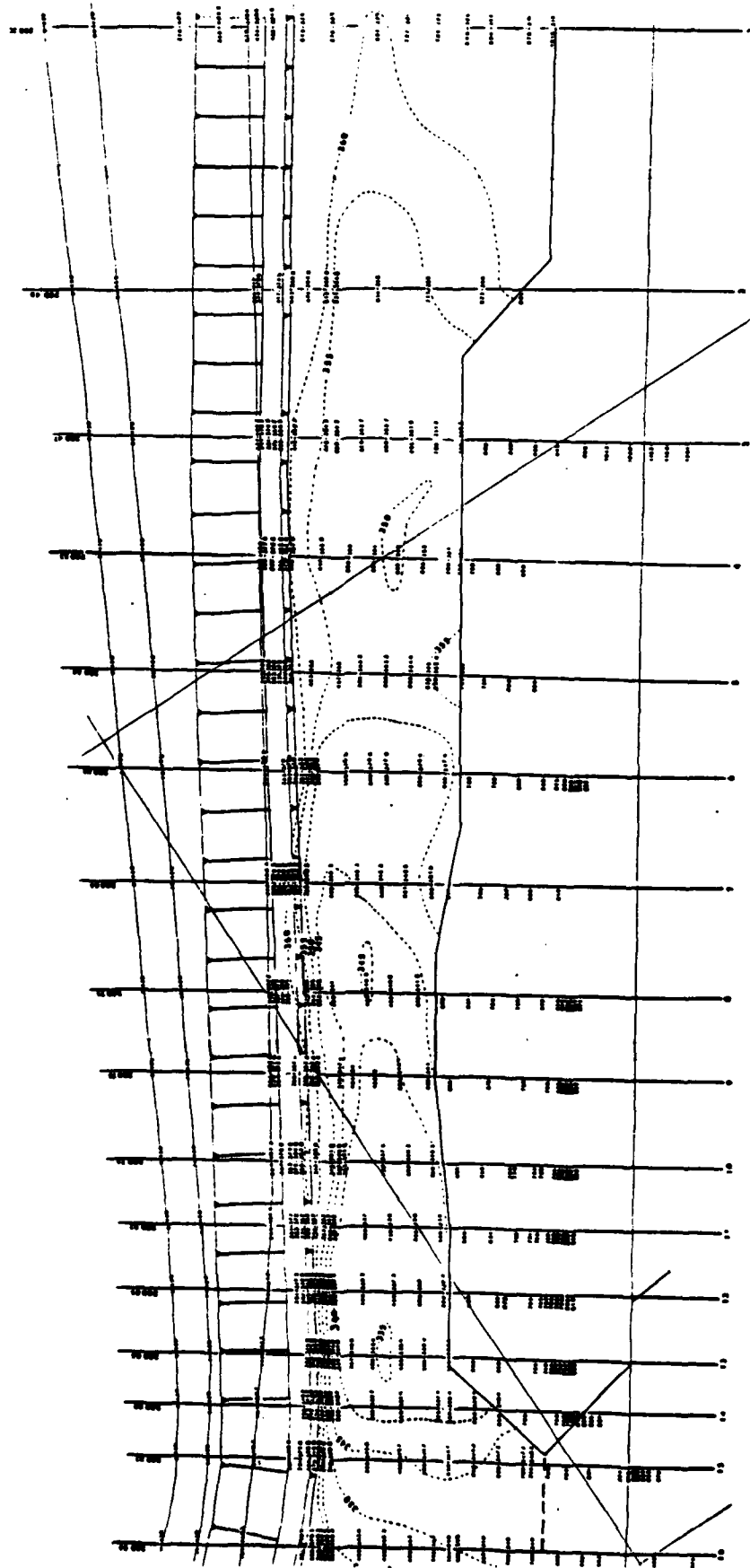


Figure 4.27. Computed contour lines (360 days later).

V. Discussion

This purpose of this study was to estimate the amount scour at the Stage II cofferdam design site by the use of the Streamtube Computer Model.

Results of these computations were presented in Chapter 4. These results show that for the typical average discharge hydrograph for 1965-1981, at the upstream end of the cofferdam, ground cells 91, 92 where the river channel is contracted, 5 feet of scour is expected. Starting with channel bottom elevations of 342 ft, around cell 92, the river bottom was scoured to an elevation of 337 ft. The contour maps generated using computed elevations indicate a concentrated scour zone located at the area of contraction induced by the flow deflector at River Mile 200.88.

Sediment routing computations were carried out with no sediment inflow to the study reach. This option was selected to: i) lack of any rational way of predicting the sediment inflow to the study reach; ii) to provide a conservative design estimate for the scour.

The hydraulic and sediment routing computations were carried out with the assumption that only 50 percent of the flows would be diverted into the constricted river channel. This assumption was made based on the findings of the physical model study made at Waterways Experiment Station which indicated a flow split of 51/49 percent between the main channel and the spillways for high flows. Water and sediment routing with different flow ratios between the main channel and the spillways, were beyond the scope of this study. However, the present computations indicate most of the scouring activity to be limited to large flows. It is believed that diverting an additional 16 percent of the discharge

through the constricted channel for discharges up to 120,000 cfs, as predicted in W.E.S. physical model study, would not cause any significant changes in the results.

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